

THE INDEPENDENT GUIDE TO IBM PERSONAL COMPUTERS



May 28, 1985

The Great Spreadsheet Face-Off

PC NEWS:
AT&T 7300
AND COMPAQ TC



**Morrow's Pivot:
A Truly Readable
Portable**

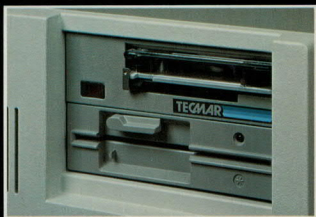
**Software over
The Airwaves**

*Wharton Students
Tackle Real-
World Problems
With 10 Top
Spreadsheets*

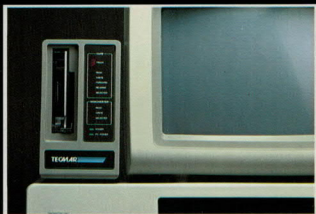


Introducing
the new
standard
in tape
backup
systems.

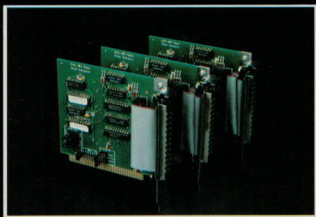




IBM PC AT
Built-in tape drive kit for your IBM PC AT — no wasted space.



Zero Footprint
QIC-60 takes no desk space!
Put it next to your CRT and your desk is free for work.



Share Your Backup
Host adaptor interface cards for QIC-60H.

Pure speed.

The second generation of streaming tape backup systems just arrived.

Breaking all records at 4 minutes flat for 20MB of mirror-image backup or restore. And speeding through a selective file-by-file backup or restore operation in under 5 minutes for that same 20MB disk.

Tecmar's latest technological breakthrough is called QIC-60™ — a line of high performance tape and disk subsystems unmatched in the market. Combining 60MB's of tape plus an optional hard disk in a package so small it fits on top of your IBM PC, XT, or AT.

QIC-60 is the fastest, simplest backup system available. Single keystrokes instantly select individual files, groups of files, or files modified since the last backup. Using file-by-file restore, you can also immediately recover the files that you just accidentally erased!

QIC-60 (tape only) back-up systems use a low cost host adaptor to interface with your computer. By installing a host adaptor in each of your computers, you can move the QIC-60 around — sharing backups and costs.

Pure power.

QIC-60 streaming tape backup is more than just fast and simple to operate. It's also the leader in powerful processing.

For example, our unique five-head tape deck offers immediate read-after-write verification. No rewinding necessary. And no re-recording of the entire backup after an error.

Another powerful advantage is automatic adjustment of the head mechanisms to seek the best track alignment every time a tape is inserted. Plus our exclusive power sensor is designed to alert and freeze the write head if PC power is reduced, which eliminates the chance of disk damage. We're so confident in the technical excellence of QIC-60 that we offer an aggressive one-year limited warranty on the entire line, compared to the 90-day warranty provided by other manufacturers.

Best of all are a pair of backup bonuses that turn QIC-60 into a sophisticated data management tool. When you select mirror-image restore, QIC-60 sees bad disk sectors and automatically reroutes data to safe locations for improved data reliability.



Tecmar offers AT owners a special enhancement with an internally-mounted QIC-60 tape drive that costs even less than external systems. And when you add our internal AT Hard Disk to the package, you have a fully upgraded system ready to use today.

Pure speed. Pure power. Pure innovation from Tecmar.

For a free demonstration of the new standard in tape backup, see your Tecmar dealer or call us at 216/349-1009 for the location of the dealer nearest you.

Tecmar
THE POWER BEHIND THE PC

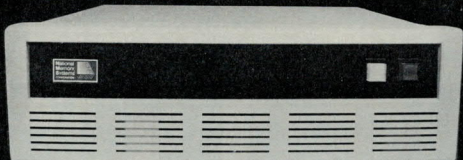
6225 Cochran Road Solon, Ohio 44139

CIRCLE 501 ON READER SERVICE CARD

Try a mainframe tradition on your microcomputer today...

Desk Top Capacities

1000 mb
700 mb
335 mb
170 mb
85 mb



Rack Mount Capacities

1000 mb
960 mb
480 mb

The NMS PC 8000 Series

- 8-inch technology-based storage
- Access times of 15 milliseconds

...National Memory Systems provides

Desk top storage to 700 megabytes:

With enhanced features for 1985, the NMS PC 8000 stays ahead of any herd with compact 8-inch technology Winchester Disk Storage systems ... used in mainframe and minicomputer installations. NMS originated use of these techniques in micro applications more than 18 months ago. We set the standard for high-capacity, high-performance mass storage systems.

Compatibility:

IBM PC-AT, XT, standard PC, and all compatibles, as well as a version to run your Texas Instruments PC, too! Ask about our multifunction, single slot disk tape controller.

Ideal for networking and distributed processing:

You gain up to 5 times the speed of 5¼-inch technology disk systems. NMS Disk Systems will not impose limitations on your computer.

File-by-File Tape Back-up:

Add our stand-alone PC.25 60 mb File-by-File and streamer ¼-inch tape system, or ½-inch PC 9000 Series, ANSI-IBM format compatible 9-track system, and you have the total solution.

Laser Optical Disk:

Be revolutionary with the 1 gigabyte NMS PC 007, a non-erasable archival system that gives you 1000 megabytes of on-line data at 1/20th the cost of tape media.

Easy Upgrades:

Mix disk capacities, disk with tape, disk with Laser Disks to meet your needs. One single-slot controller does it all.

Call Us:

All products provided by NMS are protected with our standard 1-year warranty, and optional Nationwide field services program.

**National
Memory
Systems**
CORPORATION



355 Earhart Way
Livermore, CA 94550
(415) 443-1669

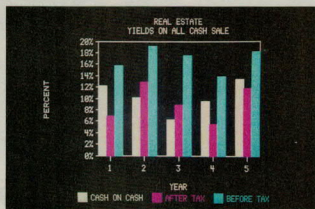
Phone 415-443-1669

TWX 9103866006
TELEX 821892NMSUD

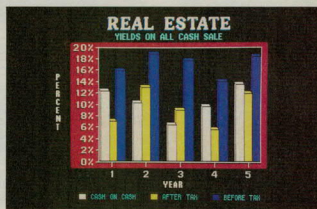
CIRCLE 185 ON READER SERVICE CARD

If You Use 1-2-3, You Ne

Make Lotus Graphics



Look Like This



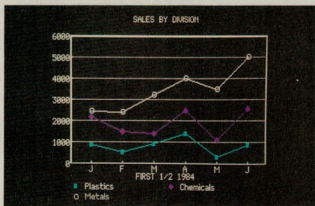
**A Keystroke Away,
The Grafix Partner
Enhances Any
Graphic Created
By Other Programs...**

GRAFIX PARTNER
*The Graphics Enhancement
Utility That Sits In Background*

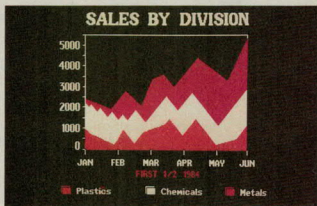
It's always there, ready to pop-up behind 1-2-3 or any spreadsheet with graphics or any other graphics program.

Use **Zoom**, **Undo**, make a slide show with **Cycle**, change colors, use patterns, **Paint**, **Repaint**, **Draw**, add **Text** using any of 20 Fonts provided, add logos, **Transfer** art and logos, **Erase**, cut & paste, highlight, airbrush, rubber-stamp, and more.

Other Business Graphics

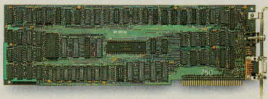


Can Look Like This



Compare the Hercules Color Card to IBM's.

Five reasons why the Hercules Color Card is better.



IBM Color Adapter \$244



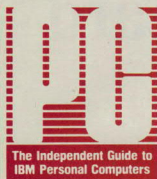
Hercules Color Card \$245

- | | | |
|------------------|--|---|
| 1. Compatibility | Runs hundreds of graphics programs. | Runs the same hundreds of graphics programs. "The Hercules Color Card is so nearly identical to the IBM Color/ Graphics Card that it's almost uncanny." PC Mag. |
| 2. Printer port. | None. | Standard. Our parallel port allows you to hook up to any IBM compatible printer. |
| 3. Size. | 13.25 inches. Limited to long slots. | 5.25 inches. Fits in a long or short slot in a PC, XT, AT or <i>Portable</i> . |
| 4. Flexibility. | Can't always work with a Hercules Graphics Card. | Always works with a Hercules Graphics Card by means of a software switch. |
| 5. Warranty. | 90 days. | Two years. |

Any one of these five features is enough reason to buy a Hercules Color Card. But perhaps the most convincing reason of all is just how easy the Hercules Color Card is to use: "Right out of the box, the Hercules Color Card goes into an empty expansion slot, ready for you to plug in . . . and go to work—no jumpers, no software. For most applications, it's just that easy." PC Magazine.

Call 1-800-532-0600 Ext. 420 for the name of the Hercules dealer nearest you and we'll rush you our free info kit.

Hercules.
We're strong on graphics.



VOLUME 4 NUMBER 11
May 28, 1985

COVER STORIES

The Great Spreadsheet Face-off .114

Phil Wiswell/PC Magazine rounded up 29 M.B.A. candidates from The University of Pennsylvania's Wharton School, divided them into teams, and asked them to work out a series of business problems using an IBM PC and one of ten well-known spreadsheet programs. We wanted to see



how well these bright, well-trained business minds could make each package perform, without having had prior experience with the program. Here we present a report on what happened at the event.

The Teams130

Phil Wiswell/PC introduces you to the student competitors who participated in the Spreadsheet Face-off—and the high-powered, high-level business people who judged the event.

What They Don't Teach You at The Wharton School136

Ray Hood and Michael Wilding/Two consultants from MicroTrek, the firm that designed the Spreadsheet Face-off problems, analyze the results of the event and draw some interesting conclusions about the use and design of spreadsheets in general.

HARDWARE

Pivot Passes the Screen Test150

Jon Pepper/Morrow's new MS-DOS lap-top computer offers several nice touches that distinguish it from the PC-compatible crowd—most notably, a backlit LCD display that's legible in any light.

OmniTel's Encore Performance162

M. David Stone/OmniTel's Encore 1200B modem offers many of the advantages of the Hayes Smartmodem 1200B at a lower price.

The DataTower of Strength182

Winn L. Rosch/Priam's DataTower brings 8-inch hard disks to the PC.

SOFTWARE

Software for Hard Decisions166

Dara Pearlman/Decision Aide and Expert Choice, two new decision-support programs, help you make the best choice when faced with complex problems.

Negotiating One-Upmanship177

William K. Howard/The Management Edge and The Art of Negotiating each offer management analysis on a floppy disk. Both are usable, but are they worth that much more than a textbook?



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LUMEN Lights up Your Room .194

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Stalking the Elusive Subdirectory Path231

John Dickinson/Several companies, including IBM, offer DOS-enhancing utility programs that provide a PATH-like facility for data and overlay files.

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Software Takes to the Air188

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PC Animation: A Dream Come True219

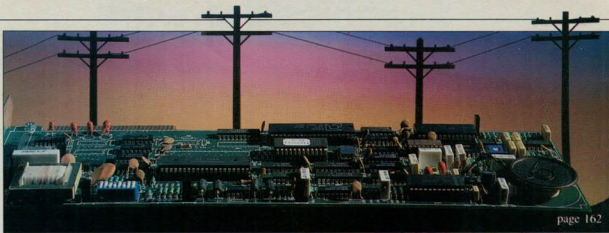
Barry Waldman/An artist tells how he uses the PC and innovative software to offset the high cost of animation and still get good results.

Simulating Nuclear Accidents ...249

Stephanie Stallings/By simulating the behavior of nuclear reactors, scientists hope to learn how to prevent nuclear accidents.



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Stephen M. Estvanik/Here's how to create real-world graphics models with fractal algorithms.

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- PC NEWS** 33
 Fifteen pages of up-to-the-minute reports, interviews, minireviews, and useful tips, along with entertaining tales, fables, and juicy scoops from the computer community.

In this issue of PC News we report on:

- Compaq's and AT&T's announcement of new machines that break ground in the field of computer communications.
- Ericsson's unveiling of its new portable with a plasma screen.
- 22 new software titles from IBM's Personally Developed Software series.



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*Terry Nastal/Amidst generous helpings of gossip and trivia, more than 60 men and women reveal how they were able to cash in on the personal computer revolution in *The Computer Entrepreneurs*.*

- PC BLUEBOOK** 324
 A quick-reference guide for PC owners and soon-to-be owners.

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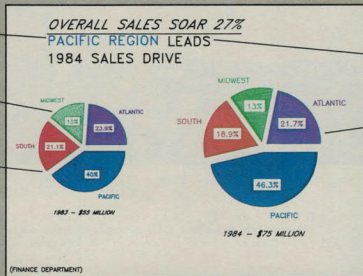
- CLUB NEWS** 352
Jane Mintzer/PC Magazine presents listings of dozens of IBM PC user groups around the nation.

- COMING UP**
PC Tech Journal 358
PC Magazine 359

Cover Photograph: Robert Phillips
 Location: Hotel Intercontinental, N.Y.C.

CHART-MASTER™

The Number 1 Choice in Business Graphics Software



Highlight a single letter, word or line

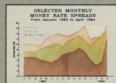
Presentation quality text: created here with bold font, italics, underline, color and left justification

Explode any or all slices

Select proportional pies

Up to 4 pies per chart, 20 slices per pie

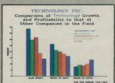
With CHART-MASTER, the possibilities are unlimited:



Area chart



High/Low/Close with moving average



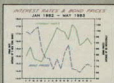
Clustered Bar chart



Horizontal Bar chart



Horizontal Stacked Bar chart



Line chart with 2 Y-axes

CHART-MASTER gives you more ways to present information to an audience than any other package on the market. And we do it with style and ease. In fact, we're the number 1 choice for those who use business graphics software on IBM personal computers.

Number 1 in Versatility

CHART-MASTER gives you more than 40 options... text options, color options, chart type options. At the touch of a key, turn data into a pie, bar, line, scatter or area chart. And best of all, CHART-MASTER can produce charts from Lotus 1-2-3™, Symphony™, Multi-Plan™, or any other program.

Number 1 in Presentation Quality

Use over 50 of the most popular printers and plotters to create crisp, clean overhead transparencies, or on-paper charts. And, razor-sharp 35mm slides are a breeze with the new Polaroid Palette.

Number 1 in Ease of Use

CHART-MASTER is designed so anyone, from top management to support

staff, can master the simple-to-follow menus. And, with CHART-MASTER'S default settings, you don't have to make endless decisions. We do the work, you get the results.

Number 1 in the Opinion of Experts

SOFTWARE DIGEST, the "Consumer Reports" of the industry, named CHART-MASTER the number one package among the top 20 business graphics programs tested. But the real experts are our customers. They've made us the number one choice in business graphics software.

See for yourself. Call or write today for a complete information kit, or a demonstration at your nearest dealer. Decision Resources, Inc., 25 Sylvan Road South, Westport, CT 06880 (203) 222-1974



DecisionResources
Software Designed for Decision Makers

SIGN-MASTER™

Number 1 in word charts for presentations and reports

Create powerful headlines using SIGN-MASTER's color, size, and font options. Here we chose Bold Roman font.

Highlight a single character, word or an entire line at the touch of a button. Here we focus attention on one number with color and underline.

Indicate source, date, author, etc. with SIGN-MASTER's footnote option. Bold Standard font was used in this example.

THE BOTTOM LINE

PROJECTED EARNINGS
(Millions of \$)

	'78	'79	'80	'81	'82
Sales	86.4	121.0	144.0	163.8	182.0
Net Income	5.9	8.8	11.4	13.4	15.7
ROS(%)	6.9	7.3	7.9	8.2	8.6
Mkt. Share	48%	61%	65%	71%	76%

Capital expenditure required: \$5 Million
Net present value = **\$24.25** Million
(opportunity cost of capital = 24%)

(Source: Annual Report)

Develop professional tables quickly and easily. Once data and text is entered, SIGN-MASTER determines the spacing and layout.

Produce SIGN-MASTER word charts on paper, overheads or slides.

With SIGN-MASTER, the possibilities are unlimited:

CAPITAL USER MARKET
4 Year Total New Buyer and 1st Year Buyer

Year	1980	1981	1982	1983
New Buyer	12,500	15,000	18,000	20,000
1st Year Buyer	8,000	10,000	12,000	14,000

Proposals

SUMMARY FINANCIAL DATA

Year	1980	1981	1982	1983
Total Revenue	\$125.0	\$150.0	\$180.0	\$200.0
Operating Profit	\$15.0	\$18.0	\$22.0	\$25.0
Net Income	\$10.0	\$12.0	\$15.0	\$18.0

Summaries

Table 1 - Comparative Data

Company	1980	1981	1982	1983
Company A	120	130	140	150
Company B	110	120	130	140
Company C	100	110	120	130

Exhibits

Example 1
COMPUTER ELECTRONICS
Product Development Schedule

Task	Start Date	End Date
Design	1/1/80	3/31/80
Development	4/1/80	6/30/80
Testing	7/1/80	9/30/80

Schedules

FINANCIAL SUMMARY

Item	1980	1981	1982	1983
Revenue	\$125.0	\$150.0	\$180.0	\$200.0
Expenses	\$110.0	\$130.0	\$150.0	\$170.0
Profit	\$15.0	\$20.0	\$30.0	\$30.0

Tables

NEW PRODUCT PROPOSAL
For the introduction of the *Bugger*

Category	1980	1981	1982	1983
Market Size	100,000	120,000	140,000	160,000
Share	5%	7%	8%	10%

Title Pages



SIGN-MASTER is the first program designed to allow everyone from top management on down to produce colorful, attention-gaining "word charts" and tables for presentations and reports.

Created on an IBM PC with a compatible plotter or printer, SIGN-MASTER word charts are superior in quality to typing and less expensive than typesetting or printing.

Professional Word Charts Made Easy

In just minutes, this unique menu-driven program lets you create impressive, easy-to-read documents using words, numbers, lines and SIGN-MASTER's simple-to-master Table Mode.

Number 1 in Quality Text

SIGN-MASTER offers the greatest variety of text options. In addition to 6 fonts, 16 sizes and 8 colors, you can justify text, underline, italicize, set margins, spacing, and more.

An Important Presentation Tool

With SIGN-MASTER and any one of over 40

plotters, you can produce full color originals on paper and overheads. The program also works with most popular printers to create the highest quality printer graphics possible.

Make Super Slides Quickly and Economically

Presentation-quality 35mm slides can be created in-house and inexpensively using the Polaroid Palette in conjunction with SIGN-MASTER.

For reports and presentations that get noticed, get SIGN-MASTER — Number 1 in word charts.

The retail price is \$245.00. Call or write today for a complete information kit and a demonstration at your nearest dealer. Decision Resources, Inc., 25 Sylvan Road South, Westport, CT 06880 (203) 222-1974

CIRCLE 157 ON READER SERVICE CARD

The developers of CHART-MASTER
DecisionResources
Software Designed for Decision Makers



IBM Left Out the Speed... Hauppauge Puts It Back!

From the inventors of the 87 Chip-in-a-Carrier Comes...

287FAST/5

The Highest Performance Math Coprocessor Module for the PC/AT

In an IBM PC/AT, the ordinary 80287 Math Coprocessor Chip runs at 4MHz. Now Hauppauge, the inventors of the 87 Chip-in-a-Carrier, bring you the 287 FAST/5, a module that delivers full 5MHz of Math Coprocessor power to your IBM PC/AT.

- **25% faster Math for the PC/AT!** Only the Hauppauge 287 FAST/5 can run at 5MHz in a PC/AT.
- **Easy installation!** The 287 FAST/5 module is carrier mounted for easy installation and removal from bent pins.
- **Low price!** The 287 FAST/5 is no more expensive than most ordinary 80287 chips.

287 FAST/5

80287 Math Coprocessor module for full speed 5MHz operation in the PC/AT. Includes diagrammed installation instructions and diagnostic diskette.

\$345.

287 Chip

80287 Math Coprocessor chip. 5MHz chip, but only runs at 4MHz in an IBM PC/AT. Carrier mounted for easy installation. Includes installation instructions and diagnostic diskette.

\$295.

87 Chip

8087 Math Coprocessor chip carrier mounted for easy installation in

\$175.

the PC, PC/XT and PC compatibles. Includes diagrammed installation instructions and diagnostic diskette.

87 Software Pak

Math interface libraries for the IBM BASIC, PASCAL and FORTRAN Compilers, also for the IBM MACRO Assembler. Plus, a set of high speed Matrix manipulation routines. Includes complete source code, a one year Software Update Service, and the BEST book on 8087 programming. B087 Applications and Programming by Richard Startz.

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(The 87 Software pak is only \$120. when purchased with either the 287 FAST/5 or the 87 Chip!)

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CIRCLE 119 ON READER SERVICE CARD

Pop-Up 1-2-3™, Pop-Up WordStar®, Pop-Up dBase®...

Pop-Up Anything!



It's great to have a Pop-Up Calculator or Alarm Clock at your fingertips. But now you can pop up an amazing new desktop utility.

We call it Pop-Up Anything. And with it you can turn your word processor, spreadsheet or application program into an instant, on-screen Pop-Up.

Imagine. You're working on a proposal and need to update your financial analysis. Just pop over to your spreadsheet, make the calculations and return instantly to your word processor. It's that powerful!

Pop-Up Anything is included with Bellesoft's new Pop-Up DeskSet. Nine handy utilities that do more than any other desktop tools. A standard and financial calculator. A Pop-Up Notepad. A clipboard to cut-and-paste from document to document. Pop-DOS for instant access to DOS commands from your program. A Pop-Up 120 year Calendar. An alarm clock that can automatically run programs. And software that dials your phone for you.

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Compare for yourself. Then call to order your Pop-Up DeskSet now.

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Use your VISA, Mastercard or American Express. Or send a copy of this ad and a check for \$69.95 (\$129.95 for DeskSet Plus) and \$5.00 shipping and handling to:

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Bellevue, WA 98004
(206) 828-7282

	Pop-Up DeskSet™	Sidekick™	Spotlight™	Poly Windows™
"Pop-Up" ANY application while running another	Yes	No	No	No
Entirely RAM-resident	Yes	No	No	Yes
"Cut-and-paste" capabilities	Yes	No	No	No
Mix and match utilities (Load only what you need)	Yes	Preset Configurations	No	Yes
On-line help always available	Yes	On Disk	On Disk	Optional
Expands to include new modules	Yes	No	Yes	Yes
Includes alarm clock with constant time display	Yes	No	No	No
Date and time "stamp" for documents	Yes	No	No	No
Stopwatch/elapsed time feature	Yes	No	No	No
Individual message displayed when alarm goes off	Yes	No	No	No
Can run programs at set times	Yes	No	No	No
Calculator with printable on screen tape display	Yes	No	No	No
Types of calculators included	Standard AND Financial	Standard	Standard	Standard
Number of calculator memories	10	1	1	1
Allows use of printer as a typewriter	Yes	No	No	No
Sends printer control codes	Yes	No	No	No
Types files to screen	Yes	No	No	No
Determines free space on disk	Yes	No	No	No
Changes drive and/or directory	Yes	No	Yes	No
Displays directories on command	Yes	No	Yes	No
Copies, renames, deletes, prints, and/or displays files	Yes	No	Yes	No
PRICE				
Non-copy-protected version	\$69.95	84.95	149.95*	84.95

*Copy-protected version only

Available at dealers nationwide.

System requirements: An IBM PC, PCjr, XT, AT or compatible. Phone dialer and telecommunications require a PC or XT and a Hayes compatible modem.

Pop-Up, Pop-Ups, DeskSet are trademarks of Bellesoft, Inc. Sidekick is a trademark of Borland International. Spotlight is a trademark of Software Arts. PolyWindows is a trademark of Polytron Corp. 1-2-3 is a trademark of Lotus Development Corporation. WordStar is a registered trademark of MicroPro. dBase is a registered trademark of Ashton-Tate.

*Plus \$5.00 shipping and handling on mail or phone orders.

* ALL PC HARD DISKS
LOW POWER

THE WORLD OF PC UPGRADES

IS10	10 Mbyte Hard Disk with Controller	\$590
IS10R	10 Mbyte Removable Hard Disk/Controller	\$1295
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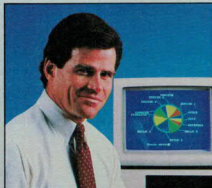
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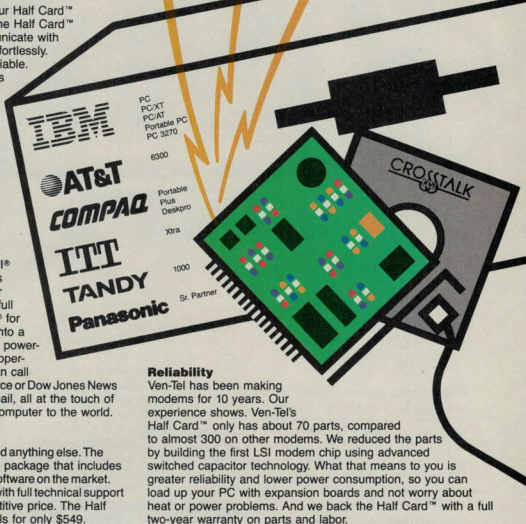
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What's Inside

The Spreadsheet Face-off was a huge success thanks to many staff members, especially editorial assistant Dave Baker, who went beyond the call of duty in his efforts to overcome Murphy's Law.

Editorial assistant Dave Baker, the general factotum of *PC Magazine's* Toy Shop, monitors the coming and going of various microcomputer-related products. He also monitors most of the major projects organized by the magazine—and the varying levels of confusion among the staff in charge. And, because Baker is such an accommodating person, he occasionally gets mixed up in chaotic events—as he eventually did at the *PC Magazine* Spreadsheet Face-off.

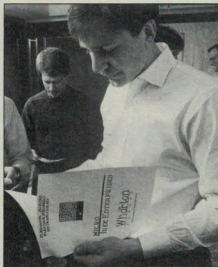
Baker was only supposed to have minimal involvement in the face-off. It was his job to call the software companies and make sure they sent the latest version of their programs on time. After that, the job of organizing and overseeing 29 industrious M.B.A. students as they competed to solve intricate spreadsheet problems would be out of his hands.

Until editor Bill Machrone came up with an idea.

A Little Spice

"Let's jazz up the proceedings a little," Machrone told public relations manager Jessica Kersey. "Let's give out the main part of the test in a locked briefcase. We can then give them the combination and say, 'Ready, set, go!'"

Kersey thought it was a marvelous idea, one that would add a little more spice to the contest. She had just joined the staff of *PC Magazine* a month before and had hardly gotten used to her first microcomputer when she found herself in the midst of the hurricane called the Spreadsheet Face-off.



Actually, Kersey's first task was rather enjoyable: to find a suitable site for the event. Well-lit and adequately powered conference rooms were needed, as well as hotel rooms for all the participants. So, while Baker called leather goods stores in search of ten attaché cases, Kersey, technical coordinator Mike O'Conne, and associate editor Barbara Krasnoff spent a sunny and not very trying afternoon visiting and assessing plush New York hotels—including, of course, their refreshment facilities. They finally chose the Inter-Continental (formerly the Barclay) Hotel because of its old-world charm and well-supplied conference rooms. And according to Krasnoff, "Any hotel that features a large bird cage in its lobby can't be all bad."

In fact, things remained on a fairly civilized level until most of the Wharton stu-

dents had assembled in the *PC* hospitality suite the Friday night before the marathon. (The hospitality suite, an elegant living room/bedroom combination, somehow ended up registered under the name of Michael O'Conne. Of course, a few wisecracks made suggestions as to why he wanted to spend a couple of nights in the suite. O'Conne refused to comment.)

Everything was ready for the big event. Ten IBM PCs were sitting downstairs under guard, ten spreadsheet packages were waiting to be opened, and ten briefcases were being delivered to the hospitality suite under the proprietary gaze of Dave Baker.

Great Expectations

Most of the students had the impression that they were in for a fun weekend in New York City. One enterprising gentleman suggested to Krasnoff that it might be a "good PR stunt" to ship all the participants to Area (a popular night spot) Saturday night. Krasnoff demurred. She suggested that the young man might not have enough time to spend Saturday night on the town.

While all the socializing was going on in the living room area, an entirely different atmosphere prevailed in the suite's bedroom. Baker was frantic.

"I can't open some of the briefcases," he told O'Conne.

As it turned out, three of the locks were broken and wouldn't open for love, money, or a screwdriver. Because it is notoriously difficult to buy briefcases late on a Friday night, even in New York,

Baker was sent out the next morning with one of the briefcases in hand to try to find three more that matched.

When he finally returned from his quest, with three reasonably identical

briefcases in hand, Baker found that his job wasn't finished. The Spreadsheet Face-off had begun Saturday morning as scheduled, but problems were already rearing their ugly heads.

Hungry Pigeons

The students attacked the test questions like pigeons after a loaf of bread. While Ray Hood of MicroTrek, the consulting firm that designed the test problems, circulated among the participants, Kersey had her ear glued to a phone, talking to various press representatives, and O'Conne clutched his toolkit, waiting for disaster to strike.

O'Conne didn't have to wait long. As the tests proceeded, several rented PCs began to display neurotic tendencies.

Luckily, the PC crew had brought along their own machine. By the time O'Conne had finished borrowing parts from his machine to fix their's, PC's computer resembled the remains of some berserk hobbyist's nightmare. Baker was kept busy running for screwdrivers, preparing the cases for their presentation, and otherwise helping to keep the other three PC staff members reasonably sane.

Until yet another computer decided to quit at about 10 p.m. Saturday night, and the magazine's spare PC was in no condition to lend out any more parts.

O'Conne did some fast thinking. "You'll have to go back and get a machine at the office," he told Baker.

So Baker made a late-night excursion to the PC Magazine offices and left with the CPU of one of the edit department's IBM PCs. Since this is, after all, New York, the sight of a man walking around the streets at 11 p.m. with a computer under his arm did not excite any comments from passersby. (It did, however, somewhat surprise associate editor Jennifer de Jong, who came in Monday morning to find a lone keyboard on her desk.)

By the time Baker returned with the machine and helped O'Conne hook it up, the clock had rounded midnight. The editors-on-duty decided it would be wise to have Baker available in case further emergency forays were necessary, and so he was accommodated with his own room at the Inter-Continental. He was also able to join the rest of the PC staff in a general state of collapse Sunday night, when the whole event was over.

"But, in the end it was all worth it," Baker says. Isn't it wonderful how time heals all wounds?

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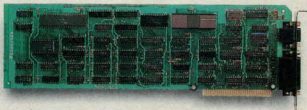
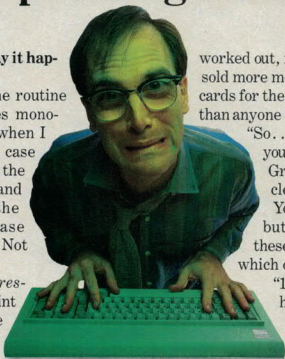
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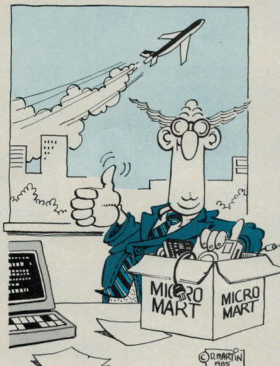
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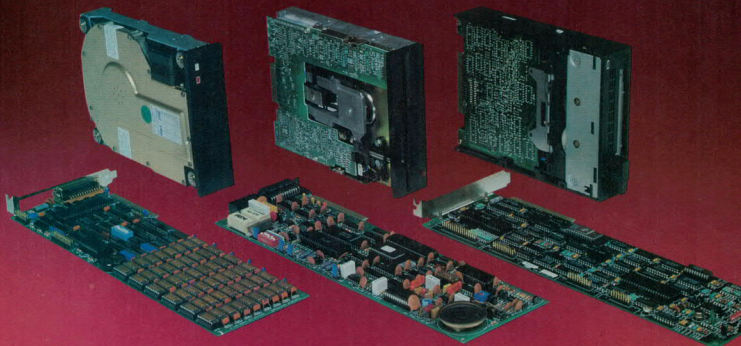
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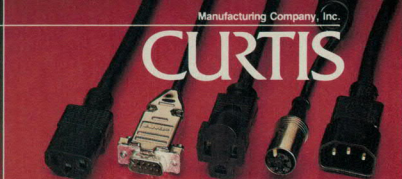
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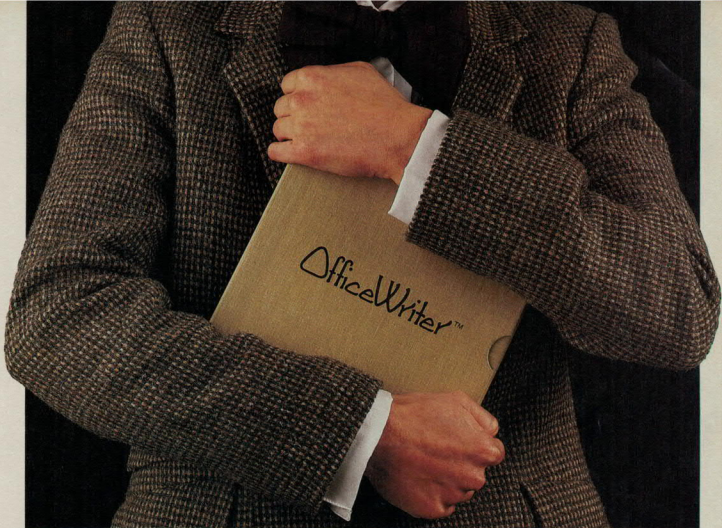
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Well, not any more. Now you can just as well and RUN/C™ bang it around, tinker with it, even — dare we say — have fun with it.

Why has C undergone this C-change? Because RUN/C is a C interpreter, and a very full implementation of the language at that. Until now, C has only been a compiled language. If you already use C, you know that means editing your program with a text editor, saving the file, calling the compiler to translate your program file, finding the errors, and going back to the editor again. Great galloping glaciars!

If Only 'C' Were as Easy as BASIC

RUN/C is different. You can write and run your program in tandem. Like BASIC it has a couple of dozen commands such as LOAD, MERGE, SAVE, and FILES. It has an editor. You can INSERT lines and EDIT lines and LIST and DELETE lines on the spot. The most commonly used commands are built into the function keys, so you don't have to spell them out.

Then just say RUN. Your program executes instantly. If an error haunts it, RUN/C explains why and where. You just EDIT the line, then and there, and RUN again.

A Great Time Saver for C Professionals

If you are already a C user, you undoubtedly see the tremendous time savings of getting out of the compiler loop. You've probably been waiting for an interpreter. Ultimately, you'll want to hand your work to a compiler, for linking, for speed of execution. But RUN/C gives you a fast front end. It is superb for blasting away at a cluster of functions until proven indestructible and suitable for acceptance into the Great Project.

RUN/C lets a pro develop and test code rapidly, without busy checking. No more making things extra tidy to Get-Ready-For-The-Compiler, where a forgotten semicolon draws fifteen minutes in the penalty

box. With RUN/C you can try out things devil may care. Let it find your typos and malapropos. It's nothing to change them and re-RUN.

An Ideal Way to Learn

If you are a newcomer to C, RUN/C makes a splendid teacher. Its manual is as big as all outdoors. It contains not just instructions how to use RUN/C, but its 475 pages provide a thorough-going demonstration of the C language itself. Every feature of RUN/C.

- all the language keywords like "for" and "while" and "case"
- all the built-in functions like "printf" and "getc" and "puts" and "malloc"
- all of RUN/C's commands like "EDIT" and "LIST" and "MERGE"
- all the data types like "char" and "double"

— all are presented in a single alphabetical procession across most of the book.

Each is accorded its own micro-chapter with examples of how to use. Over 100 of these chapters are devoted to RUN/C's built-in functions, and every one lists a sample program showing how it is used. These same programs are on the disk. So as you read them in the manual, you can run them on the screen, see what they do, discover why they do it. And tinker with them, try things out, see what effects your changes have.

How RUN/C Does It

RUN/C handles the differences between the compiler and interpreter environments with great common sense. As an interpreter, it expects nothing but source, but it includes can pull in #define and other source code files — functions you have already written, for example, or functions from commercial libraries which provide source code like Greenleaf and BASIC-C. The #include files stay hidden. They don't blot your listings. And they don't SAVE with the main you're working on. No littering your system with hazardous copies (no point mimicking that "feature" of BASIC).

Or, external files may be MERGED into your listing at any point — these will display and SAVE with the host file.

The Features Keep Coming

The more you look, the more powerful this product gets. It has valuable tracking toggles to show what's going on behind the scenes as a program executes. Switch on TRON, which displays on screen each line of source code as it executes (intermingled with what the program puts to the screen). It shows just where you were in the program when it departed for the back of beyond. Or try TRACE, which shows the current values of all variables referred to in a source line each time it is encountered. Or turn on FRON and then list a program after a run — each line appears with a number as in

<12> printf("something");

which says that the line was executed twelve times, a vivid picture where to optimize for efficiency.

There's more. RUN/C has just added interrupts for PC DOS users, functions which halt execution of your program to directly call for services from the operating system, and then return to your program right where it left off.

Even Shell Capability

And more still. RUN/C has a SHELL command which will invoke any operating system command, with both RUN/C and your program still in memory. No need to exit and reload everything.

And finally, the EDITOR command. When RUN/C arrives, tell it the name of your favorite editor's COM or EXE file. Ask for it and RUN/C will load your editor in parallel so you can switch back and forth. (You'll probably need more than 256K.)

It's all here. A thoroughly satisfying integration of text, source code examples, editor, interpreter and utilities which will add both speed and pleasure to programming.

Product Code: 50900 # Our Price: **\$129.00**
List Price: **\$150.00**

NOTES FOR THE PROS. WE KNEW YOU'D ASK, SO...

RUN/C occupies 185K, and requires 256K. It can handle programs of up to 2000 lines. Its hundred-plus built-in functions replicate those found in most compiler libraries. So when you compile RUN/C programs, these function calls will find library counterparts. As RUN/C favors no compiler, some functions may not be present in yours, or yours may have functions RUN/C does not.

Structures, unions, and initializers are supported, as well as keyboard and screen redirection from and to files. There are functions to access ports. No extern definitions, and all functions must be #included or MERGED — an interpreter expects everything on board. Typedef and register not supported. RUN/C automatically senses and uses 8087 math chip.

THE BIG CHANGE FROM BASIC TO C

If you are a BASIC programmer and have gotten the message that C is where the world is headed, then we have the perfect package deal. With your RUN/C, we'll also send you BASIC-C. It answers the question of what to do with all those BASIC programs. It translates BASIC into C. And we'll send BASIC-C. It's a library of source code subroutines which perform all those handy chores that you are accustomed to in BASIC: MIDS, INSTR, STRING\$, ... over 80 of them! The following page tells more. Take all three at this special price:

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C is a bare-bones language. It does not have built-in (machine dependent) functions for printing or floating point math or string manipulation. That's why it's so portable. That's also why libraries of pre-written functions are such big sellers: bullet-proof routines your application can effortlessly call to get the job done.

GREENLEAF FUNCTIONS

More than 200 functions in C and/or assembler source, and a 200 page manual with examples and demos. 32 DOS extensions: file and directory manipulation for DOS 1.1 and 2.0. 23 Screen Functions: Select mode, page, monochrome or color palette, cursor shape, positioning, clearing and scrolling, character reading and writing with attribute and color control, pixel get and put, read light pen.

60 String Functions: Manipulation of strings including center and justify, efficient list operations which add, delete, and sort pointers to strings for top speed.

50 Graphics Functions: Primitives to access all graphics; typeface, formatting, and forms control for IBM Graphics Printer.

Plus keyboard status and function key assignment, time and date algorithms... we could go on!

Product Code: S0770 * Our Price:
List Price: **\$175.00** **\$140.00**

MULTI-HALO AND THE DOCTOR

Premier Graphics Library Now Supports 19 Boards

If you've been reading this space, you'll recall our saying that Halo was fast

GREENLEAF COMMUNICATIONS

Want your application to communicate with other users or remote data bases? Now you can build asynchronous communications right into your C programs.

Over 60 functions set up an interrupt driven scheme with separate transmit and receive ring buffers (characters are simultaneously loaded at one end and transmitted from the other, or vice versa) for an arbitrary number of ports. Interrupt control means you can download a record, then halt the incoming stream to file it, display it, let the user tamper with it, send it back up line. It all happens within the context of your program, using your user commands, and does away with the side-step to the separate communications software (and its semantics) you had to use until now.

The Greenleaf Comm Library supports ASCII or binary, any parity, any word length, 8250 UARTs, all four Lattice C memory models, Hayes 300, 1200, 1200B and other modems.

Its 80-page manual has examples of each function, discusses asynchronous communications, and both the library and demo programs come with source (a mix of C and assembler!).

Product Code: S0750 * Our Price:
List Price: **\$160.00** **\$130.00**

LATTICE C-FOOD SMORGASBORD

Decimal Arithmetic: Trigonometric, logarithmic functions, powers, conversion to strings, BCD operations for numbers up to 15 significant digits. Level I/O Functions: Direct operations for screen, keyboard, printer, and async port with no dependence on higher level I/O will minimize memory usage and maximize speed.

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Terminal Independence Package lets you move programs to computers with other types of terminals.

Product Code: S0200 * Our Price:
List Price: **\$150.00** **\$115.00**

Quite a treasure. So cost effective that after using only a couple of functions you'll be saving a bundle compared to writing your own. (It's true, how much do you cost per day?) So why not go for the whole bundle!

BASIC_C

Use Your Knowledge of BASIC to Learn C

If you're getting the message that switching from BASIC to C would be prudent, you're about to discover that it's back to basics of a different sort: BASIC is fat with hidden functions that stripped down C just doesn't have.

Gone are all those handy string manipulators like LEFT\$, MID\$, STRING\$, etc. (although our library offerings add them back). In C, when you reach for even simple incantations like INPUT or PRINT AS.X%, well, sorry to disappoint, but underlying such expressions in BASIC are bulging macros which C cannot have if it is to keep its slim profile.

But now comes BASIC_C and all your old favorites are back. Someone has written the full set of C functions to mimic BASIC's vocabulary, from ABS to WRITE. Over 80 routines to open and close files, "field" file buffers, convert their contents from and to strings (the CV? and MK? series), peek and poke, print using, clear screen, "instr", on error goto, ... they're all there. Some have reworded names and syntax to suit C, but all are written as one-to-one functional equivalents to the familiar features of BASIC. And they are documented one to a page in alphabetical sequence like the Microsoft manual for added familiarity.

So with BASIC_C when you're thinking INPUT, go ahead. Use it. Or LPRINT or LOCATE or INKEY. But without BASIC_C you will find that every line of code plunges you back in the C texts to figure out how to write it. Someday you'll want to, but for now, BASIC_C will start your programming quickly at the statement level and you can concentrate on C's larger concepts.

There's a bonus: an unusually well-written manual with a first rate chapter comparing how BASIC and C go about their business. With this question, BASIC_C will ease your transition to C.

Product Code: S0350 * Our Price:
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LATTICE WINDOW

All Your Applications Could Have Windows!

Windows are no gimmick! Ask any user of a windowed product. But how do you add this technique to your applications without disappearing for several months to R&D?

With Lattice Window™. A rare programming tool which will change the way you think of program design. Lattice Window takes over all screen management. It is an extensive set of object code functions which you merely call from your C program.

Think of a window as a screen of flexible size. You can tell Lattice Window to open and close up to 255 visible screens from 1x1 to 255x255 bytes. Then tell "Window" to display any portion of these visible screens on the physical screen—as many as fit—wherever you want, overlapping and overlapping well.

Windows no longer needed may be closed. Any background area overlaid earlier (which could be corners of several windows) will pop back to the screen. Think for a moment what a programming job that technique represents.

To your program, the entered window is the entire screen—all row and column references are relative to the window no matter its absolute position on the screen. All scrolling occurs only within the active window. The cursor will not leave its boundaries until your program says to.

- You can move a window on the screen.
- You can grow it to completely fill the underlying virtual screen. Or shrink it.
- You can control screen attributes (color, blinking, inverse video, etc.)
- You can direct output to either the monochrome or color display.

Product Code: S0800 * Our Price:
List Price: **\$295.00** **\$235.00**

BASTOC NEW! It Translates Your BASIC Programs Into C

You'd like to upgrade C, but what to do with that warehouse of BASIC routines you've carefully polished over the years? And how about converting your venerable Leviathan accounting system from BASIC, much less your Labyrinth file management package?

With BASTOC™ a translator which takes in BASIC source code and emits pure Kernighan & Ritchie C. BASTOC understands Microsoft Extended BASIC, both interpreter and compiler forms of CBASIC (except for dynamic dimensioning and common), and can be tailored to understand other dialects. It will optionally convert your program into a single monolithic C function or will decompose it into separate functions, one for each DOS/BIOS label.

Strings are dynamically allocated in the target program, ridding your application of BASIC's catatonic halts for garbage collection. BASTOC will try to create the structure of even the most convoluted BASIC code, and writes any indigestible statement into the C output as a comment plus explanation. Also, you optionally can tell BASTOC to insert BASIC source lines into the C target code.

Source code of several modules of the translator and library are provided so you can tailor BASTOC to your environment if needed. And source of the entire product is for sale.

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PMATE

The Programmer's Word Processor

Pmate™ was designed for programmers. We'll wager that you cannot find a programmer who has discovered Pmate and moved on to something else.

Pmate is a full screen editor with ten auxiliary buffers for squinting away pieces of text until needed. It uses single key commands to move the cursor, or text, or insert or delete, or rescue several thousand characters of deleted text.

It has a format mode for tab setting or wraparound and shaping when it's time to write documents. Pmate lets you assign chains of commands or strings of text to single keys: a keystroke could set up the entire shell of a new C function, for example.

Pmate has variables if then statements, loops, it calculates, and converts decimal to hex to binary and back. You can write compact programs (called "macros") to delete comments, for example, or check syntax, or process long sequences of commands. Macros can call alphabetize lists, do row and column math, perform a series of operations on multiple files, even summon other macros.

Put another way, Pmate is a text editor with its own built-in interpretive language. A language you can use to completely customize this text editor to your needs. Possibly the most useful, ingenious program you have ever seen.

Product Code: S0600 * Our Price:
List Price: **\$225.00** **\$175.00**

becoming a standard graphics language. It's now become so dominant that the newest incarnation, Multi-Halo, supports nineteen graphics cards, and comes with a multitude of mouse and printer drivers. All with one purchase, replacing the previous one board per copy.

Within your Lattice program an function call can reset drivers. You can arrange that your application program doesn't care what board the customer has, you can even switch boards within a program, as when two different monitors are used.

Halo is a complete library of graphic functions which can be linked with your Lattice programs to create full-color graphics, charts, simulations, animation.

Over 100 commands are at your disposal, including plot, line, arc, box, circle, plus single commands to produce bar graphs and pie charts. Pattern-fill, utilize graph simulations, animation. Over 100 commands are at your disposal, including plot, line, arc, box, circle, plus single commands to produce bar graphs and pie charts. Pattern-fill, utilize graph simulations, animation.

Multi-Halo allows you to define your own world coordinate scheme, divide the screen into windows, and scale graphic images automatically.

Multi-Halo is a library of functions to utilize from your Lattice programs. Dr. Halo is a standalone program, written in Halo. It's dazzling. Your screen becomes a canvas, and a mouse (preferable) your paintbrush to take you wherever your imagination leads. Save the images to disk, run them by with Dr. Halo's slide show feature.

Suggestion? Use Dr. Halo as a freethand application to design what you want your application to do.

List Price: Code: Our Price:
Multi-Halo S0950 **\$250.00** **\$199.00**
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If your programming still gets anywhere near the files, here's our guarantee. Nothing will increase your productivity faster than handing the filing job to a sophisticated file manager.

Btrieve™ is the best we have seen. It takes complete charge of all file access, reading, writing, insertion and deletion. It builds 22 commands right into the language you use in the form of functions you call to tell Btrieve what to do. The commands create, open, and close files; delete and insert records; recapturing vacated space; find records which exactly or most nearly match keys; walk files by ascending or descending key. Btrieve's foundation is a balanced-tree indexing scheme, conceded to be the fastest search technique devised (it will find any key in a million-plus item index in four or less accesses).

Btrieve comes with interfaces to C,

Pascal, BASIC, and COBOL, and the manual gives you working sample programs which demonstrate every command in all four languages. The kind of presentation which led PC World to exclaim "for those of us who have endured poorly written and inadequate manuals, this one is a pleasure to read."

Btrieve has mainframe specifications! A single file may have up to 24 indexes. Segments of keys may be indexed. Each index can independently accept or block duplicate keys. A record length can be up to 4096 characters; an index length 255 characters. A file may be 4 billion bytes. It can even extend a file across two drives — even two hard disks!

With Btrieve you are freed to think logically; the physical file is no longer of concern. Gone for good is all that time-wasting tinkering with intricate file-referencing schemes and sorting algorithms. Thinking shifts to a higher plane.

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Designing custom screens is intricate, time-consuming, and costly. It can make you the loser in competitive bidding. It can add weeks, even months to bringing your product to market.

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Panel's latest version coexists with Lattice Window. Forms and formats can now be designed to overlay, replace, move, or under Windows control.

Panel supplies source code of keyboard input verification routines, so you can adapt it to any special validation needs. It even includes a multi-key data file maintenance program which interacts with the screen you design. It has all the tools you need to generate code for the trickier aspects of your application.

Panel programs are powerful. Unlike so many programs which make error correction difficult once a file is departed, Panel gives the user full field-to-field movement for editing, and overtype or insert/delete within fields.

A truly superior productivity tool every developer should have.

Product Code: S0460 ** Our Price:

List Price: \$295.00 \$235.00

*except "Tailor"

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PLINK86

Size Unlimited with This Overlay Linker

Software is becoming ever more sophisticated, which means more complex programs requiring larger chunks of memory. But if you use extra memory you count on users to have expanded RAM, and forego sales to those who do not.

Plink86™ is the answer. It shoe-horns large programs into small memory. First, Plink86 acts as an alternative to DOS Link. C encourages design of separate, compiled object modules in the Microsoft relocatable format. Plink86 pulls modules together into single compiled programs. But Plink86's overlay power is what has gained it a reputation as a program linker. It binds into the compiled program its overlay manager which knows how to swap modules of your large linked program between disk and memory so that each can temporarily occupy the same memory space.

Unlike other linkers, the overlay manager acts on its own, needing no link from the source program. Instead, Plink86's straightforward overlay description language allows you to describe your overlay structure in one place in your program — a structure permitting up to 4,095 overlays stacked 32 deep. No re-compiling to re-arrange the structure.

Plink86 can even sub-divide its linked output into multiple files for programs which must span more than one disk. And it produces a symbol map for debugging with Plink86.

PC Tech Journal calls it "the premier linker and overlay loader that's taking over at many of the programming shops around the country."

Product Code: S0500 ** Our Price:

List Price: \$395.00 \$315.00

LATTICE C

The Pre-eminent 16-bit C Compiler

C is a structured approach encourages development of tight, fast code. Functions which can be counted on to return reliable results every time. Its local variables are unknown outside of functions which safeguard against accidents elsewhere. C offers powerful nested expressions which produce elegant, concise code. That's why C has become the language of choice among professionals.

Lattice C™ is the Number One C compiler. Peter Norton in PC Magazine (1/8/85) says, "best for systems programming... tight code... total control of what's going on... noticeably better than any of its competitors." After reviewing time-compliant for the PC the PC Tech Journal unequivocally declared Lattice C "best for software development... it completes fast and produces fast programs."

Lattice C runs on virtually any computer using an 8086 or 8088 chip, and generates code which optimizes use of the 8087 chip if present. Create your source files with any word processor or text editor like our Plink86 or ES/P for C and Lattice C will.

compile them into Intel 8086 object module format for linking to other modules by DOS's Link or our Plink86.

Lattice C offers a choice of four memory models between 64K and RAM capacity for program and data to allow the program designer to choose the right combination of small memory efficiency and large memory addressability for an application.

Lattice C is a full implementation of Kernighan and Ritchie (K&R), not a subset, with some extra features, e.g., variable names up to 39 characters, and nested comments.

The compiler comes with a library of I/O routines which implement under MS™-DOS most of the Unix-compatible standards described by K&R, and then goes beyond. It has a fulsome set of transcendental and Unix math functions K&R didn't think to mention, and some of Unix's most useful options such as "fork," which can pull a second program into memory without disturbing the first, branch to it, and return.

Product Code: S0100 ** Our Price:

List Price: \$500.00 \$CALL

ES/P for C

This Editor Knows 'C'

ES/P for C is a language dedicated editor. Press Alt and a companion key and it sets up a complete framework of a C structure, whether if-then-else, do-while, switches, loops — even the outer frameworks for "main" and entire functions. Inside the structures, ES/P then outlines the components to be filled in. In, say, a declaration segment, ES/P prompts for what's needed, shows menus of options — e.g., "int," "char," "float" — and fills in the semi-colons and curly braces for you.

If you erect the superstructure of an entire program in minutes, with everything properly nested, code neatly indented, and reserved words highlighted, it can operate on four files at once in separate windows.

Let ES/P look after syntax and punctuation so you can concentrate on programming.

Product Code: S0450 ** Our Price:

List Price: \$349.00 \$275.00

Product Code: S0250 ** Our Price:

List Price: \$129.95 \$105.00

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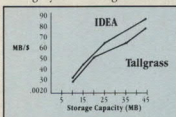
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Getting Busy Signals From Compaq, AT&T

IBM's entry into the phone-computer market is expected to come soon.

BY VIRGINIA DUDEK

NEW YORK—It is a technological union that seems as inevitable as the marriage of sound and film that produced talking pictures in the late twenties. Computer companies have been courting communications giants for months, and in several instances, the coupling has already taken place. In late March, the first fruits of these pairings were presented to the public in the form of hybrid machines that are both microcomputer and telephone.

Compaq Computer Corporation was, by a single day, the first company to proudly show off the new "telecomputers." AT&T countered by showing off its Communications Manager expansion card with a built-in modem, simultaneous voice and data transmissions, and one-button dialing. The card is designed for the AT&T 6300, and the IBM PC, XT, and most IBM compatibles.

AT&T also displayed the 510 Business Communications Terminal, targeted for the manage-



Compaq's new TeleComp.

AT&T's Personal Terminal 510.

rial level. This unit combines voice and data capabilities, telephone management functions, and electronic mail. It has a built-in phone and uses a gel-based touch screen to control voice features, message retrieval, directory dialing, text messaging, database access, and to operate a calculator. STARLAN, the AT&T office networking system that integrates MS-DOS and UNIX System V workstations in a single network, and the long-awaited UNIX PC, an enhanced PC 6300, were also announced.

TC or Not TC

While the AT&T line is designed to allow easy plug-in of that company's sophisticated telephones, Compaq is attempting to break new ground with the TeleComp line of six

"telecomputers" that combine telecommunications and desktop computing. A new subdivision of Compaq, the Compaq Telecommunications Corporation (CTC), developed the machines.

The TCs, as Compaq refers to them, feature integrated voice/data communications, built-in communications supports, and personal productivity software that combines the various desk

(continued on next page)

IBM Cuts Prices, Unveils New XT's

BY CHARLES BERMANT

BOCA RATON, Fla.—As March went out like a lamb, industry observers were heating up the speculation mill. They were variously expecting IBM to unveil either a lap-top, a new home machine, or the long ru-

mored PC-2. But a Big Blue press release on April 2 yielded less spectacular announcements: new configurations of the PC-XT and price drops on the rest of the PC line except for the PC AT.

The cuts, from \$125 to \$500

(continued on page 38)

Compaq and AT&T (continued from preceding page)

organizer programs already available.

The user can move between tasks with display panel keys connected to the various functions. Six configurations offer a combination of fixed and flexible disk storage and interconnect capabilities to both digital and analog telephone switches.

Compaq officials acknowledge that only the arrangement of the devices is really new, yet they insist the TC is "a step beyond what is already offered." The company is striving for true integration, "a multifunction machine that you can use in the first 15 minutes."

Additional features include a built-in Hayes 300/1200 baud modem, a Z-80 8-bit telephony and datacom processor with 64K memory, two 360K disk drives, a third drive for personal productivity software, and a separate phone unit with integral speakerphone, handset, manual dialing pad, and control buttons. The six models are priced between \$4,195 and \$6,395.

"Compaq is going after a market opportunity," says Randall Sherman, vice president, telecommunications and office automation at Creative Strategies in San Jose, Calif. "Now that it's self-sufficient, it's attacking markets independently. It's a reality test for the company of what the market is doing."

Others see the reality setting in already. "I would like to have seen an existing interface for a PBX such as the SX 2000," says Amy Smith, a senior analyst at the Yankee Group, Boston. (The SX 2000 is a PBX made by Mitel, Inc.) Although Compaq has announced an agreement with Mitel to develop a proprietary interface for the SX 2000, that product is not yet available. Smith feels that such an interface would have given Compaq a head start.

Rooting for Rolm

Smith says that IBM and Rolm are prepared to address the market when the time is right, and that no real technical

innovations have been put forth by Compaq. "As far as IBM is concerned, it's set. IBM has the Rolm products and the installed base. I speculate that telephony functions are the next thing we'll see, maybe at the end of the next PC cycle."



AT&T's UNIX PC

"Compaq says it it would like to lead in at least one or two areas," says Chris Christianson. "It's a pretty courageous move for a company that a lot of people expect to fail. But I think the move is well calculated. Compaq doesn't make rash decisions."

Norm DeWitt, director of the personal computer industry service at Dataquest in Cupertino, Calif., agrees that Compaq did well to enhance its product line and to expand distribution beyond the retail channel. "We can expect to see IBM enter the market in the very near future," he speculates, "though I do not think it will bowl anyone over because it has to interface with the Bell phone network. That's the strength of AT&T."

New UNIX PC

AT&T has strength in other areas as well. The company's announcement of the multitasking, multi-user UNIX PC also attracted considerable attention. Designed to simplify the user interface with the UNIX operating system, the base unit contains a hard disk drive, a floppy drive, a modem, the CPU board, and three expansion slots. The CPU provides the processor logic, bit-mapped graphics logic, and interface logic for all connected I/O devices.

"It's an interesting product," says Chris Christianson, senior analyst at the Yankee Group, in Boston. "It really brings UNIX down to the PC market. But does the PC market want UNIX? Most people find MS-DOS sufficiently baffling. AT&T must sell the product to software developers, retailers, and VARs first. Pushing it into end users' hands is a secondary consideration."

Legitimacy

"This could be the machine that legitimizes UNIX in the marketplace," says Frank Derfler, a purchaser of microcomputers for the Federal Government and contributing editor to *PC Magazine*. "But the number of good multi-user applications software packages can still be counted on the fingers and toes, as opposed to the number of database management sys-

tems on PC or MS DOS."

Enhancements to the AT&T 6300 include a communications manager for simultaneous voice and data transmission, the XENIX operating system, a high-speed coprocessor, and a 20-megabyte hard disk. But the 6300 may not carry AT&T into the multi-user market.

"It's just jacks for openers," says Derfler. "It's what AT&T needs to just enter the marketplace." Derfler feels that the 6300 is competing against an "as yet unannounced IBM product that I suspect is right around the corner," instead of against the IBM XT or AT. "The 6300 is not new and different enough to make much difference. AT&T will live and die on UNIX, not the 6300. UNIX can really make a mark for AT&T and legitimize the company in the consumer's eye."

Hotlines to Hybrids

ANALYSIS

BY BILL MACHROME

The big story behind AT&T's new products announcements is, finally, communications. Everyone has been predicting AT&T's entry into low-end communications, but it's taken a full year for all the pieces to fall into place.

STARLAN is the glue that holds them all together. The low-cost network is designed to run on all of AT&T's machines, from the PC-compatible 6300 to the 3B series minicomputers. The new UNIX PC (or the 7300) speaks STARLAN too. So everything talks to everything.

STARLAN is especially important because it runs on twisted-pair wiring: ordinary telephone cable. This network's 1-megabit-per-second data rate is fast enough for all but the most demanding applications, certainly enough for office communications. Nobody knows better than AT&T just how many miles of copper wire are in the nation's buildings, and how many of them are

spares, unused by telephones. Use of spare lines and judicious addition of cabling will be very attractive to corporations seeking to network PCs.

When installation is included, cabling is the largest single networking expense. Coaxial cable not only costs more than twisted pair cable, but is more expensive to install. You need fewer and simpler integrated circuits to drive twisted pair networks, another cost savings.

LAN of the Giant

STARLAN uses Intel's 82586 network controller chip, the same one used by IBM's PC Network. AT&T's board uses simple line drivers to connect to twisted pair cables, while the PC Network adapter uses a complex RF modem. Future versions of the STARLAN adapter will use Intel's new 82588 chip (see "Intel Hits With New Chip," PC News, Volume 4, Issue 3).

This new chip permits even lower board cost, less hardware, and simpler software. The 588 chip is actually capable

(continued)

Hotlines (continued)

of driving twisted pair networks at up to 2 megabits per second, equaling PC Network in line speed.

Of course, network performance depends on much more than line speed. The network operating system and file server programs are even more critical. PC won't be able to test STARLAN until the fall, so the jury is still out on its true performance potential.

Computer/telephone hybrids are the latest fashion in deskwear. The UNIX PC has phone jacks and a built-in modem. The new TeleCompaq is a Deskpro and a telephone in a package that redefines "ungainly." AT&T even introduced a card for the 6300 that is both a modem and communications controller.

Of the three, the last is the most significant. The unique thing about the 6300's communications card is that it has an on-board microprocessor that permits the board to run in background. A broad range of electronic communications can then take place without interfering with the user's foreground task. In low-volume situations, it can even replace local area networking. More importantly, it presages a new generation of cards with on-board intelligence. It and others to follow will allow a PC to do far more than it can now, simply by dividing tasks among dedicated microprocessors.

TC No Magnum

Compaq's shotgun wedding of a Deskpro and a desk phone is self-described as unique and trendsetting. Yet it falls short on several key points. Like Zaisan's ES.3 (see "Zaisan's Message: PC, Phone-in-One for \$2,995," PC News, Volume 3 Issue 20), it uses a second microprocessor to run the phone. Unaccountably, it is not blessed with enough intelligence to do communications tasks in background.

To retrieve electronic mail, you must suspend normal foreground activities, then use the mail service "manually." While switching is rapid, re-

quiring just a keystroke, it shouldn't be necessary at all. One ray of hope: The software that controls the phone is downloadable from the MS-DOS main computer. A Z-80 8-bit processor actually runs the phone, and maybe someone with a little more imagination will program this popular chip to run communications in background.

The TeleCompaq is also way too expensive for most businesses. Companies will flock to these hybrids when they start looking more like a phone with a free computer rather than a

computer with a free phone. In the case of the Compaq, you're paying a premium for both.

AT&T and Compaq are coming from radically different places to get onto the manager's desk. For once, AT&T is coming to the market with an innovative product, full of fresh thinking. The TeleCompaq had to stay within reasonably well-defined boundaries so as not to scare the telephone companies that will likely form its distribution channels. Its compatibility with a wide variety of digital and analog PBXs is, at this stage of the game, more attractive to

the phone companies than to end users. It proves that Compaq speaks their language.

There was never any doubt about AT&T's fluency in telephony. That's why Ma Bell had the freedom to be innovative with the 7300 and its companion personal workstation. A network of 7300s or 3B2s supporting individual phone-equipped work stations will not only cost less than an equivalent network of telePCs, but will outperform the networked PCs when doing what most businesses mean by networking: sharing centralized data. ■

Ericsson Turns New Leaf With 15-Pound Portable

BY CHARLES BERMANT

GREENWICH, Conn.—Ericsson Information Systems, a Swedish company that markets a line of ergonomically designed microcomputers, has introduced a powerful 15-pound PC-compatible portable com-

port. For an extra \$600, the memory can be increased to a total of 512K.

Also available as options are a 300/1200 baud Hayes-compatible modem, costing \$300, and a thermal-transfer printer that lists for \$395. Both are internal devices.



The plasma screened Ericsson Portable PC.

puter that is, the company says, "the first desktop portable with a high-resolution plasma screen."

The machine's base price is \$2,995, which includes 256K of memory, one 5 1/4-inch disk drive, and a serial and parallel

Plasma Premiere

The Ericsson Portable PC follows an industry trend toward full PC performance in a much smaller package. Its flat-screen, gas-plasma technology gives it an apparent advantage over similarly configured machines with

liquid crystal displays, which are generally considered more difficult to read. However, since the company says its new portable won't be widely available until fall, other companies, including IBM, could nullify Ericsson's early edge in the market.

Margaret Halpin, Ericsson's market communications coordinator, says, however, that IBM's actions are of little concern, adding, "We feel our machine is better designed for the work environment and office needs. The machine is really worth it."

The machine uses the Intel

The Ericsson Portable PC follows an industry trend toward full PC performance in a much smaller package.

8088 processor and operates on either 110- or 220-volt current. It has no provision for battery-powered operations. Ericsson company officials describe it as a desktop, rather than laptop, computer.

There are currently no expansion slots on the machine, but Ericsson hopes to soon make available a bus-connected expansion chassis that has the room needed to accept two expansion boards. ■

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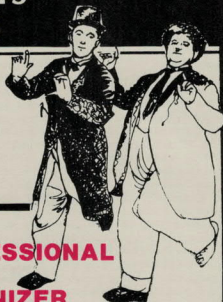
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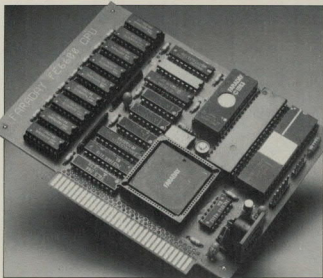
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Truly Micro . . .

A plug-in, single board computer has been introduced by **Faraday Electronics** of Sunnyvale, California. Called the **Faraday Micro PC**, it is compatible with the IBM PC



The 8088 driven Faraday Micro PC.

and, according to the company, well-suited for compact and portable computers.

The Micro PC was designed around Faraday's FE 2010 CMOS integrated circuit. It features an 8088 CPU with optional 8087 co-processor, 256K of parity-checked RAM, 32K of user-EPROM space, 4 DMA channels, 3 timer channels, one IBM-compatible keyboard port, one speaker port, and one reset port. The Faraday Micro PC costs \$695, and supports UNIX and PC DOS, Concurrent PC DOS and VRTX.

Faraday Electronics, a major supplier of IBM PC bus-compatible single-board products for OEM manufacturers, is located at 743 Pastorina Ave., Sunnyvale, CA 94086, (408) 749-1900.

Exterminating AT Bugs . . .

Atron has introduced the **AT PROBE**, a hardware-assisted debugger that resides on a PC AT. The AT PROBE can tackle difficult program bugs by intercepting signals to and from the processor and trapping and tracing all that happens in the system.

Because the AT is so powerful and its application programs so large and complicated, the AT PROBE also had to be very powerful, according to Perry Lynne, vice president of marketing for Atron.



Atron's AT PROBE teams hardware and software for debugging chores.

The AT PROBE has a 1-megabyte on-line symbol table, a real-time tracer, and the ability to set up breakpoints on reading or writing memory, I/O, instruction execution, or interrupt. It supports standard assemblers as well as high-level languages.

The AT PROBE comes with performance and timing analysis software that allows you to create histograms that show where the execution of different procedures takes place. The AT PROBE has a retail price of \$2,495.

Atron corporate headquarters are at 20665 Fourth St., Saratoga, CA 95070, (408) 741-5900.

Latest in the Series . . .

There's a new model in the IBM System 9000 family of scientific and industrial computers—microsystems built around the 68000 processor that are incompatible with IBM's PCs, but similar to them in scale (see "PC's Powerful Cousin: The IBM CS9000" in PC, Volume 3 Number 5). The **IBM 9003** is designed to operate in an industrial environment, controlling machine tools and robot devices.

The computer's 66-inch-high sealed cabinet and closed-loop air conditioner allow it to function at temperatures of up to 125 degrees Fahrenheit and to resist water, dust, and oil-mist contaminants.

This system, which can run under XENIX, is priced at \$21,130. The 9003 will be available in the second quarter of 1985 from IBM Instruments, Inc. For more information, contact IBM Corp., Information Systems Group, 900 King St., Rye Brook, NY 10573.

Setting the Standards . . .

Many people feel that computing would be much easier if more standards were established and set. Apparently, the members of the **Network Users Association (NUA)** agree, and they have voted to endorse the use of networking and interconnection standards. This endorsement applies to physical interface and packet-switching standards as well as open systems interconnection standards.

NUA president Mike Harrop says he hopes that the organization's support will help the overall standards-development effort.

All NUA members will have access to the NUA Handbook, which will contain a list of sources for the standards. The handbook, and more information on the NUA, is available from **Network Users Association**, 2111 Eisenhower Ave. #400, Alexandria, VA 22314, (703) 683-8500.

Business-Pro's AT Performance

AUSTIN, Texas—Texas Instruments has entered the AT-workalike competition with its "hybrid" Business-Pro, which the Austin-based company claims is both IBM AT- and TI-Pro compatible.

Scheduled to reach dealer shelves in June of this year, the

and text equivalent to that of the IBM Color/Graphics adapter. For maximum flexibility, both controllers, priced at \$495 apiece, can be installed in the machine.

The Business-Pro is compatible with NetWare/E-TI software and allows a local area network of up to 50 PCs and 3 printers to share its beefy 144 megabytes of disk storage. The network uses EtherLink LAN hardware.

The basic configuration with system unit, keyboard, serial/parallel interface, 512K RAM, and 1.2-megabyte floppy drive costs \$3,995. The enhanced base model adds a speedy 21-megabyte Winchester drive (its 30-millisecond average disk access time is 1/2 faster than the AT's disk access speed) and is priced at \$5,795. Eight other configurations for the Texas Instrument AT-workalike are available, ranging in price from \$4,440 to \$10,785.

—By Virginia Dudek

Texas International's Business-Pro.

TI Business-Pro is based on the increasingly popular 80286 microprocessor, running at 6 mHz. While 512K of RAM is standard, users can install up to 3.6 megabytes on the motherboard itself, without having to waste any of the machine's 14 (8 full-size and 6 half-size) expansion slots. Serial and parallel ports are also built into the main board, eliminating the need for basic add-on I/O boards. The chassis can hold as many as six half-height drives, in a variety of configurations; fully loaded, the Business-Pro boasts a pair of 72-megabyte hard disks, a 1.2-megabyte floppy similar to that in the PC AT, and a 60-megabyte tape backup.

While the Business-Pro can reportedly drive a 720-x-300 pixel TI color monitor, users can add a separate IBM-compatible video card for graphics

IBM Cuts Prices (continued from page 33)

per machine, were less than many analysts had expected. If the action was a signal, opinion was divided as to what it meant.

The new PC-XT versions, designed to give customers greater flexibility in meeting their personal computer needs, each boast 256K memory and are outfitted with either one or two 360K floppy disk drives. Fixed disks are not standard equipment. The machines feature the XT planar board, which includes the 16-bit Intel 8088 microprocessor and the XT power supply.

The new XT's are priced at \$2,270 for one floppy disk drive and \$2,570 for two. The only differences between the new XT's without fixed disks and the older standard PC are the power supply and the number of expansion slots—the new models have 8 to the PC's 5.

These specifications prompted speculation that the new XT could eventually take the place of the PC. The move came 2 weeks after the discontinuation of the PCjr. Reaction was mixed as to whether IBM would scale down the PC's price to the PCjr's level or phase it out entirely and replace it with a cost-reduced compatible.

Kindest Cut

When asked if the cuts were a prelude to the discontinuation of the PC, company spokesperson John Q. Pope said "Customers are going to buy what they want. The PC has not been withdrawn."

Industry forecasters had mixed reactions. "We thought that the price cuts would be more substantial," says Jim Weil of The Yankee Group in Boston. "IBM looked at the elasticity of demand and saw it could generate as much sales with a smaller cut as a large one. But I expect another round of cuts before the introduction of the PC-2. The way prices are now there would be too much overlap."

Weil says that some compatible makers must now be "heaving a sigh of relief" as to the size of the cuts.

"The PC has been selling for three and a half years," says John Hemphill, senior analyst for Future Computing in Dallas. "It's well into a product cycle, and it has some unneeded features, like a cassette port. It makes sense for it to go away. The rearrangement makes a lot of sense."

Hemphill said that IBM could be setting the stage for the discontinuation of the PC in the next 6 months.

Other new prices are: PC-XT, 256K, one disk drive, 10-MB fixed disk, \$3,895 (128K, \$3,775); PC, 256K, two disk drives, \$2,115; PC, 64K, two disk drives, \$2,195; PC Portable, 256K, two disk drives, \$2,895.

The price of the bare-bones PC which comes with 64K and no disk drives, was increased from \$1,265 to \$1,390. No reason for the price hike was offered for that action. ■

IBM Fixes Disk Problems

Shortages are no longer expected.

BOCA RATON, Fla.—IBM, which once relied exclusively on fixed disks manufactured by Computer Memories, Inc. (CMI) of Chatsworth, Calif. for its PC AT, will now market the machine with hard disks from two additional sources.

Besides CMI, IBM itself and a third, unnamed source will

manufacture AT hard disks. IBM's own disks, manufactured in Rochester, Minn., are already in production but have not been shipped. IBM has made no projections as to when the supply of ATs will meet demand, but the company expects to double shipments during the next quarter, according to an IBM spokesperson. IBM currently installs some of its own fixed disks in the PC-XT.

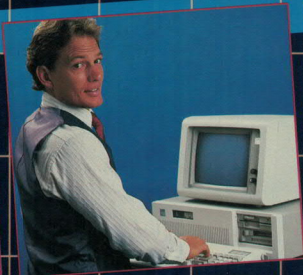
Hal Prewitt, president of

CORE International, a hard disk manufacturer based in Delray Beach, Fla., says IBM was more careful about selecting the third AT disk manufacturer because of earlier problems with the CMI drives first used in the AT. Prewitt says that IBM was being "a lot more cautious," and ordering disks from several companies for product testing. He says that his company did not participate in the process because of IBM's stated desire to produce a high volume of drives at a low cost.

—By Charles Berman

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* Actual time: 2 min/57 sec. Total files backed up: 376 consisting of 10,002,432 bytes. Computed on IBM-PC with 512K memory and one 10MB hard disk drive. Your actual back-up time may vary.

† IBM is a trademark of International Business Machines. Compaq is a trademark of Compaq Computer Corporation. NCR is a trademark of NCR Corporation.

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CIRCLE 437 ON READER SERVICE CARD

Join the network

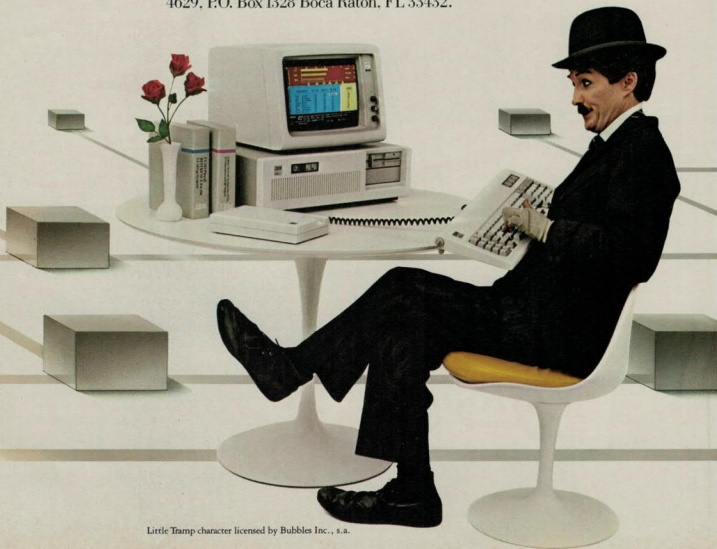
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For complete details about joining the network call 1-305-241-3102. Or write IBM Corporation, Editor: IBM Personal Computer Seminar Proceedings, 4629, P.O. Box 1328 Boca Raton, FL 33432.



IBM PC Network Specifications

IBM PC NETWORK ADAPTER

HARDWARE HIGHLIGHTS

MICROPROCESSORS

- 6MHz 80188
- 6MHz 82586

MEMORY

- 32K PROTOCOL ROM
- 16K RAM
- 8K NET BIOS ROM

VIDEO COMPATIBLE RF MODEM

- TRANSMIT 50.75 MHz (CH T14)
- RECEIVE 219 MHz (CH J)
- SUPPORTS 1000 NODES
- MAXIMUM DISTANCE 5KM RADIUS FROM HEADEND
- MULTIPLE SERVICES POSSIBLE

DIAGNOSTICS

- POWER-ON SELF-TEST
- ON-LINE MEDIA MONITORING

OTHER

- SUPPORTS DMA DATA TRANSFERS
- 2-MEGABIT/SECOND DATA RATE
- MID-SPLIT BROADBAND

FIRMWARE HIGHLIGHTS

OPEN ARCHITECTURE

- PEER-TO-PEER NETWORK
- OPERATING SYSTEM INDEPENDENT
- LOCALNET/PC™, PUBLISHED LAYERED PROTOCOL

FUNCTIONS

- BASE FUNCTIONS PROCESSED ON THE ADAPTER, NOT THE PC
- DISTRIBUTED NAME SUPPORT
- REMOTE PROGRAM LOAD
- 32 CONCURRENT TWO-WAY SESSIONS
- HIGH THROUGHPUT RATE AT SESSION LAYER
- CHARACTER SET INDEPENDENT

IBM PC NETWORK CABLING SYSTEM

IBM PC NETWORK TRANSLATOR UNIT

HARDWARE HIGHLIGHTS

- SINGLE RF CHANNEL CONVERSION
- ATTACHMENT OF UP TO 72 PCs WITH IBM CABLING
- ATTACHMENT OF UP TO 256 PCs WITH CUSTOM CABLING
- DATA ONLY
- ALLOWS NODES WITHIN A 1000-FOOT RADIUS

CABLE

TYPE

- STANDARD CATV MEDIA (75 OHM COAX)
- TREE TOPOLOGY
- CATV STANDARD F-CONNECTORS
- PREBALANCED BROADBAND NETWORK

KITS

- BASE EXPANDER (ALLOWS EXPANSION FROM TRANSLATOR)
- SHORT-DISTANCE KIT (1 FOOT ADDITIONAL CABLE)
- MEDIUM-DISTANCE KIT (400 FEET ADDITIONAL CABLE REQUIRED)
- LONG-DISTANCE KIT (800 FEET ADDITIONAL CABLE REQUIRED)
- CABLE AVAILABLE IN 4 LENGTHS: 25 FT, 50 FT, 100 FT, AND 200 FT.

MAXIMUM PCs AND DISTANCES SUPPORT

RADIUS FROM TRANSLATOR

PCS

- | MAXIMUM PCs AND DISTANCES SUPPORT | RADIUS FROM TRANSLATOR | PCS |
|-----------------------------------|------------------------|-----|
| • TRANSLATOR ONLY | 200 FEET | 8 |
| • 8 SHORT-DISTANCE KITS | 200 FEET | 72 |
| • 8 MEDIUM-DISTANCE KITS | 600 FEET | 72 |
| • 8 LONG-DISTANCE KITS | 1,000 FEET | 72 |
| • 8-KIT COMBINATION | 200 to 1,000 FEET | 72 |

IBM PC NETWORK SOFTWARE

DOS 3.1

EXPANDED SUPPORT FOR NETWORKING

- FILE SHARING
- RECORD LOCKING DOWN TO BYTE LOCKING

PROGRAM INTERFACE TO NETWORK SOFTWARE

- REDIRECTION CONTROL
- INSTALLATION CHECKING
- DIRECT EXECUTION OF NET BIOS FUNCTIONS
- MULTIPLE SERVERS

IBM PC NETWORK PROGRAM

FULL SCREEN INTERFACE AVAILABLE

REDIRECTOR

- ALLOWS USE OF SHARED PRINTERS
- ALLOWS USE OF SHARED DISKS AND DIRECTORIES
- PROVIDES CAPABILITY TO SEND MESSAGES

FILE SERVERS

- SHARED USE OF NAMED DISKS OR SUBDIRECTORIES
- PASSWORD PROTECTION AGAINST UNAUTHORIZED ACCESS
- VARIETY OF ACCESS MODES SUPPORTED (E.G. READ ONLY)
- RECORD LOCKING TO CONTROL MULTIPLE UPDATES

PRINT SERVER

- SHARED USE OF NAMED PRINTERS
- PASSWORD PROTECTION AGAINST UNAUTHORIZED ACCESS
- AUTOMATIC SPOOLING AND QUEUING OF OUTPUT
- QUEUE MANAGEMENT FACILITIES ON SERVER STATION

MESSAGE SERVER

- INTERACTIVE MESSAGE EDITING/TRANSMISSION/RECEPTION
- PRESERVES FOREGROUND APPLICATION CONTEXT
- AUTOMATIC NOTIFICATION OR LOGGING TO DISK/PRINTER

LOCALNET/PC IS A REGISTERED TRADEMARK OF SYTEK, INC.



BUYERS GUIDE TO DESKTOP ORGANIZERS

A COMPARISON OF THE MOST POPULAR PRODUCTS

	PolyWindows Desk	Sidekick	Spotlight
ROLODEX-TYPE FILES			
Variable Card Size	YES	NO Files	NO
Multiple Card Decks	YES (1-10)	NO Files	YES
Number Cards Per Deck	RAM Limit	NO Files	500 Max.
Max. Characters Per Card	999	NO Files	480
Search	YES	NO Files	YES
Auto Alphabetize	YES	NO Files	YES
Print Card	YES	NO Files	YES
Print Deck	YES	NO Files	YES
CALENDAR			
Daily Notes	YES	NO	NO
Mark Important Days	YES	NO	NO
Date Range	1752-2099	1901-2099	1901-2099
APPOINTMENT BOOKS			
Multiple Appt. Books	YES (1-10)	NO	NO
"Things To Do" List	YES	NO	NO
Print Appointment Book	YES	YES	YES
ALARM CLOCK			
Display Time	YES	NO Alarms	YES
Hourly Chimes	YES/Optional	NO Alarms	NO
Time Format	AM / PM	NO Alarms	AM / PM
Display Alarm Message	YES	NO Alarms	NO
Number of Alarms	9	NO Alarms	Many
CALCULATOR			
On-Screen Tape	YES/Optional	NO	NO
Printing Tape	YES/Optional	NO	NO
Percentage Function	YES	NO	YES
Display With Commas	YES/Optional	NO	NO
Floating/Fixed Decimals	YES/Both	Fixed	Floating
Memory	YES	YES	YES
Insert Result in Work	YES	YES	YES
Max. Display Digits	15	18	12
Display Number > Above	YES/Exponential	NO	NO
Scientific Notation	YES	NO	NO
Binary/Hexadecimal	NO	YES	NO
NOTEPAD			
Multiple Documents	YES (1-10)	NO	NO
Word Wrap	YES	NO	YES
Merge Files	YES	NO	NO
Change Margins	YES	NO	NO
Variable File Size	YES	YES	NO
File Size Limit	64K	50K	4.4K
Variable Window Size	YES	YES	NO
Print Document	YES	YES	YES
Print Window Only	YES	YES	YES
Undelete Key(s)	YES	YES	NO
Cut & Paste Screen Text	NO (Note 1)	Import Only	NO
KEYBOARD ENHANCER			
Number Keys Redefined	YES Up to 60	NO/Not Avail.	NO/Not Avail.
Total Key strokes	YES 2500	NO/Not Avail.	NO/Not Avail.
GENERAL CHARACTERISTICS			
100% Memory Resident	YES	NO	NO
Minimum Memory Used	47,500	61,300	77,200
Typical Memory Used	50-75K	61,300	77,200
On-Line Help	YES	YES	YES
Moveable Windows	YES	YES	NO
Redefine Colors	YES	YES	YES
Expandable/Add Functions	YES	NO	NO
Can Remove Functions	YES	NO	NO
Integrated Interface	Excellent	Good	Good
Visual Appeal	Excellent	Fair	Poor
Speed	Very Fast	Fast	Slow
ADD-ON FUNCTIONS			
Auto Dialer	NO (Note 2)	YES	YES
DOS Functions	NO (Note 1)	NO	YES
Game	YES	NO	NO
ASCII Chart	NO	YES	NO
COST - PROTECTED	\$49.95	\$54.95	\$149.95
COST - UNPROTECTED	\$84.95	\$84.95	NO/Not Avail.

Note 1: "PolyWindows DOS" add-on available soon at extra cost to add cut & paste and many additional functions.

Note 2: "PolyWindows Phone" add-on available soon at extra cost to add auto-dial, phone log, cost computation, etc.

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to PolyWindows
Desk
and
No!
to Sidekick
and Spotlight.

Thousands of PC users are choosing PolyWindows Desk over Sidekick and Spotlight every week. It's easy to see why.

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DESK

PolyWindows Desk was written by Thomas A. Crispin.
Works with IBM PC, XT, AT & true compatibles.
Requires DOS 2.0 or later, TopView Compatible.

Opening the Envelope On Electronic Mail Service

Telecommunications may not be as private as you wish.

BY ERIC FREEDMAN

"People are concerned if they see their mail opened when it comes to their home. They don't think of it when they use electronic mail, and they wouldn't even know because there's no Scotch tape on the envelope," says Norma Rollins, acting director of the New York Civil Liberties Union.

Electronic mail is now a \$100-million-plus-a-year industry, and its expanding popularity as a medium of business and personal communication is sparking worries over the privacy and confidentiality rights of its users.

Industry systems operators, civil libertarians, attorneys, and government officials share those concerns with electronic mail service users. However, few laws guarantee the privacy of electronic mail communications from curious or malicious computer users, from industrial espionage, or from government itself. "Everything is in a gray area," says executive director Michael F. Cavanagh of the Electronic Mail Association (EMA). Government agencies are obliged to follow strict procedures before opening a traditional letter or eavesdropping on a telephone call. But, as Rollins points out, no laws now on the books prevent government interception of electronic mail "because of the mode in which it's transmitted."

Steve Metalitz, staff director of the U.S. Senate Judiciary Subcommittee on Patents, Copyrights, and Trademarks, which has jurisdiction over privacy legislation, is "concerned about the privacy of data communications. If they've never been in voice form, they're not

protected by the wiretap law."

So far, law enforcement agencies have not made many demands on system operators to disclose the contents of customers' files and messages. But given the proliferation of PCs and the growing use of both in-house and commercial electronic mail services by business and personal users, such demands for access are bound to increase.

Seeking Access

The best known government attempt to gain access to a subscriber's private information from a commercial electronic mail operator occurred in Detroit. A federal grand jury there subpoenaed the Source Telecommunications Co. for information about an alleged international cocaine trafficker who used The Source. The grand jury sought "printouts of any and all records, data, documents, or electronic mail" about the suspect, his associates, and their business operations.

The U.S. Attorney in Detroit contended that the material was not legally protected from disclosure in the same way that a letter or telephone call are. The Source provided billing information, but contested the demand for substantive material. There was no court ruling on whether The Source was required to make a complete disclosure; the dispute became moot when the grand jury issued indictments.

Self-Regulation?

In the absence of federally-mandated procedures regulating protection or disclosure of electronic mail files, the industry has relied on voluntary privacy measures. For example, the Videotex Industry Association (VIA) drafted "model privacy guidelines" and urges its members to adopt them to "help inspire consumer confidence in this new technology."

Regarding court orders to release information about their subscribers, VIA executive director Robert Smith, Jr. says, "Most system operators have adopted our guidelines, or something pretty close to them."

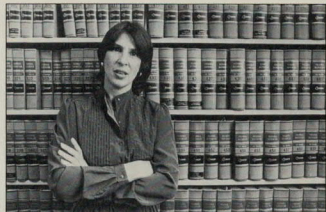
Companies that provide commercial electronic mail services insist that they are committed to confidentiality, whether the demand for disclosure comes from individuals or businesses. "It's as private as anything that goes through the U.S. mails. We do not read it. We do not let any-

have to come from Congress.

EMA's Cavanagh believes Congress should act against all three types of those he considers to be abusers: curious users, corporate spies, and official agencies. "There has to be legislation that puts together a unified response so system operators and subscribers can know what the law is," he explains.

But Rollins says, "It's not a question you can answer with one set of rules: Control of government access should be the priority for action. It's clear they shouldn't just decide to intercept electronic mail on a fishing expedition. There ought to be some strict legal standard."

Civil liberties groups favor requiring official investigators to follow procedures similar to those governing access to telephone communications. Such



Norma Rollins, acting director, New York Civil Liberties Union.

body read it. The customers' files are confidential," says CompuServe's Paul Battaglia.

There is some apprehension that voluntary efforts will not adequately safeguard personal privacy. As Rollins, who heads the NYCLU Privacy Project, put it, "Industries follow voluntary guidelines to ward off government action. They work only as long as it's economically worthwhile to follow them."

Capitol Hill

Some states are modernizing their criminal laws to address the aforementioned problems of computer crime and unauthorized private access to electronic databases. However, a comprehensive legislative answer to privacy in electronic mail will

procedures would force officials to prove they have reasonable cause to believe the content of the database is relevant to the investigation and to show that the government can't acquire the information through "less intrusive" means.

On Capitol Hill, Senators Charles McC. Mathias (R-MD) and Patrick J. Leahy, (D-VT) say they hope to draft electronic mail privacy legislation.

That's no easy task. Noting that new laws regarding confidentiality of computer databases could have implications for other aspects of the rapidly changing world of telecommunications, such as cellular phones, Metalitz reiterates, "It's a difficult area to legislate."

Digital Detention for Prisoners of PCs



You may sometimes feel like you're chained to your computer, but several probationers in Palm Beach County, Fla. are actually being held prisoner in their own homes by an IBM PC.

A 3-ounce, waterproof transmitter is strapped onto a leg of each misdemeanor offender who agrees to be monitored by a company called Pride, Inc. rather than serve time in prison. Under terms of the probation, offenders are required to remain in their homes during specified times. The leg device, which sends a signal every 35 seconds, must be worn around the clock—even while bathing.

Any attempt to remove the leg device will damage it, which is a sign that probation has been violated during times of required confinement. If a monitor unit in the probationer's home fails to detect a signal from the leg transmitter (range=150 feet), it sends a parole violation message over phone lines to an IBM PC in Pride, Inc.'s office.

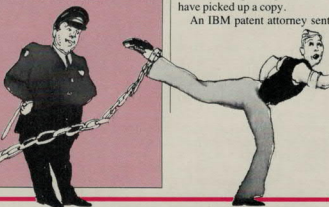
About 20 probationers are currently connected to the system in Palm Beach County, according

to Glen Rothbart of Pride. Over 50 offenders—most were sentenced for driving while intoxicated (DWI), driving with a suspended license, or substance abuse—have successfully completed their PC-enforced probation since the trial operation began in December 1984.

Probationers volunteer for this program and pay a fee to install the computerized shackles that might allow them to continue working at their regular jobs during the day while fulfilling their sentences at night and on weekends. A cash deposit is forfeited if parole is violated or if the transmitter or monitor are damaged or disconnected.

Tom Moody, the inventor of this truly turnkey system, said "If man makes it, man can defeat it. But no one has figured out a way yet."

That opens the doors to a new genre of computer crime. An accomplice might write a program that fools the guard system's PC—and smuggle in the "escape" file by baking its diskette inside a cake. ■



The Unanswered Crypts of Paris

Super Encryptor, made by Obsidian Computer Systems, includes routines that scramble and unscramble data files to make them unreadable by unauthorized eyes. To demonstrate the protective powers of its encryption routine, Obsidian has challenged buyers of its program to decipher a sample encoded file, called PARIS.TXT, on the program disk. If you are

the first to reveal the message, Obsidian will send you and a friend to Paris for free. So far the prize remains unclaimed.

At least one of *Super Encryptor*'s customers seemed more interested in winning a free vacation than in protecting his own secrets. "He complained that he could have cracked it if our manual told more about the program," said Charles Dixon, president of Obsidian. "But the purpose of our manual is to give users enough

technical information to secure their own files—not to break into theirs."

The latest version, *Super Encryptor II*, also includes a public-key security system and DESTROY—a file command that eliminates all traces of sensitive data you want gone for good. The program, priced at \$225, is available from Obsidian Computer Systems, 236 North Santa Cruz Ave. #243, Los Gatos, CA 95030, (408) 395-7900. ■

Coming to Terms With Brain Divide Overflow

It's taken awhile, but popular fiction is catching up with the language of personal computers. Here's a sample from a short story by Alice Kahn, "East Bay Wives," published in Berkeley, Calif.'s weekly *East Bay Express*:

"Mai knew her friend Bree was close to the edge; it would either be a psychic breakthrough or a nervous breakdown.

"But I'll be damned if I'm going to come to her emotional rescue, Mai thought. One thing was clear: Bree Wellington's mental spreadsheet had run out of columns."

Kahn's turn of phrase is in the tradition of a classic programmer's insult: "He's running double-sided disks in a single-sided drive." ■

IBM's Initial Concerns Strike in Texas

Can you tell the difference between a magazine and a computer? IBM's lawyers seem afraid that people will get the two mixed up.

InBetween Magazine is a bi-weekly tabloid covering news and entertainment in Galveston and the Clear Lake Area in Texas. For over 7 years, articles appearing in *InBetween Magazine* ended with a dark rectangle around the magazine's initials—IBM. But this winter, a certain computer giant must have picked up a copy.

An IBM patent attorney sent

a letter to Steven Long, publisher of the Texas magazine, to remind him that "'IBM' is an extremely valuable mark which should be used only to identify products and services of IBM Corporation. Any other use could lessen its value and confuse the public. . . . Your reference on page 3 of the Hi-Tech section to 'IBM (The big one)' demonstrates the confusion being created."

IBM's attorney concluded with a "request that you use a different combination of letters, for example, 'IM' or 'IBT' when referring to yourselves. Please call or write me to confirm that you will discontinue use of the IBM trademark."

InBetween Magazine's staff debated how to respond to the bigger IBM's trademark warning, said Curtis Brown, special projects editor. "Our publisher wanted to surrender," said Brown. "I wanted us to fight it. And the marketing director wanted us to merge."

In March, the Texas magazine announced it would terminate its controversial end sign, in respect for IBM's concern "that consumers might suffer from some confusion and buy one of our magazines instead of one of our computers." It also announced that a prize would be given to the reader who suggests the best replacement. In between now and the contest's conclusion, articles are ended with an open triangle, signifying nothing. ■



The Price is Right—Look it Up

It looks like you've found a great deal on a used PC and modem—the ad said the hardware was owned by a little old lady who only sent electronic mail to her children on Sundays. But how do you know if the price is right?

If you were buying a car, you could sneak a peek at a salesman's "blue book"—a price guide to used cars of every make and vintage, compiled by the National Auto Dealers Association.

Now there's a similar authority for used personal computers, peripherals, and software. The 3,000-member National Computer Dealers Association (NCDA), based in Houston, Texas, publishes the *Official New and Used Computer Price Guide*, a blue-covered, hip-pocket book that puts a price on thousands of previously owned computer products.

NCDA editorial director Ray Davis said that all the prices in the guide are actual prices at

which each used item has been sold—advertised asking prices weren't taken at face value. The NCDA gathers this sales-price data from 10 used computer dealers and by responding to classified ads a month later to ask what amount sellers actually received.

Davis said the NCDA's guide is also used by major insurance companies and banks to determine the value of a client's computer assets when evaluating damage claims or loans.

The retail edition of the *Official New and Used Computer Price Guide*, which lists prices for over 3,000 used products, is available in bookstores and on single copy orders from NCDA for \$12.95. A wholesale edition, with over 6,000 listings in each quarterly issue, is available by subscription. Send \$34 for four quarterly issues to the National Computer Dealers Association, 13231 Champion Forest Dr., Houston, TX 77069, (713) 586-0209. ■

Look for the Union Label

So you think you're a patriot because you resisted the temptation to buy a cheap, Asian-made PC clone. Instead, you laid your money down for a red, white, and big blue all-IBM system. While that might have been a wise purchase, don't credit yourself too much for buying American. An exploded view of a PC, published in *Business Week* (March 11, 1985), reveals that nearly three-quarters of the PC's manufacturing costs are for foreign-made parts.

A typical PC system, including the IBM monitor and printer, costs \$860 to manufacture, according to figures supplied by Future Computing and Businessland. Of this, \$165 is sent to Singapore for a pair of disk drives, \$85 to Korea for the monitor, and \$375 to Japan for the printer, keyboard, power supply, and half the chips. At the domestic end, IBM spends only \$230 for the remaining chips, the case, and labor to assemble the computer.

It's probably still important to Buy American—but it's getting tougher to know when you can. ■

Bosses Beware of a Snake in the DOS

All work and no play is the usual lot of PC users with monochrome systems, because almost no arcade-style games have been designed to run on their green screens.

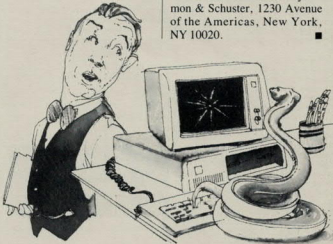
It's fortunate, then, that *Snake*, one of the only monochrome action games, is not only a good piece of entertainment, but has a key command that suits it to an office environment. If you're in the middle of a round of *Snake* when your boss approaches, you can press the B key to instantly blank out the screen. Just remember that B stands for Boss.

When the coast is clear, you

can resume the game by pressing any other key. But if your boss stops and asks you to do a job on the spot as he looks over your shoulder, the game lets you cover your tracks by pressing the B key a second time. That causes the PC's screen to return to the DOS prompt, leaving no trace of your *Snake* break.

Snake's job-saving B command is easy to learn. The manual prompts you to remember this rule: "Two Times 'Boss' equals DOS."

This Baen Software game, priced at \$29.95, will run on color systems as well as monochrome. It's distributed by Simon & Schuster, 1230 Avenue of the Americas, New York, NY 10020. ■

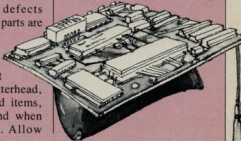


Alright, the Ugly Ones Are Free

Intel Corp., maker of the microprocessors in IBM's personal computers, is offering free chips, boards, and systems to educational institutions for use in classroom or academic research and development projects. The freebies, drawn from Intel's full line, were rejected for cosmetic defects only—Intel claims the parts are perfect, electronically.

Interested instructors should write a free-equipment request on school letterhead, describing the desired items, their planned use, and when the parts are needed. Allow

several months for the request to be fulfilled; also keep in mind that Intel will not process any requests until July 1985. Write to Emil Sarpa, Corporate Manager for Academic Relations, Intel Corp., 3200 Lakeside Dr., Santa Clara, CA 95050. ■



Basic Dot Matrix printing just got better.

DATA MANAGEMENT SYSTEM - SORT BY CUSTOMER NO.
SHIP TO CUSTOMER MASTER
SHIP TO;
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SHIP TO CUSTOMER NO.
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95051
Bill Wayne, Inc
6102 4th Street

Thanks to Fujitsu, now there's a basic, economical dot matrix printer that's everything but basic.

The DotMax 9 is flexible—flexible enough to adapt to most of your basic printing needs. It produces near letter quality, high-density printing at a 25-character-per-second rate. Or draft-quality documents at a rapid, 180 cps clip. A wide variety of character sets are also standard.

The DotMax 9 is uniquely affordable when compared with other 9-wire head dot matrix printers. But with the DotMax 9

DotMax 9™



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The DotMax 9 is from Fujitsu. For over 30 years we've been a technology leader and equipment supplier to companies worldwide. Rugged reliability is our hallmark. Quality and value are our trademarks. Don't settle for just the basics when you can have a DotMax 9.

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CIRCLE 309 ON READER SERVICE CARD

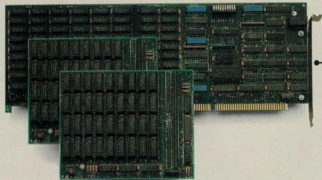
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Quadmeg-AT

Quadport-AT



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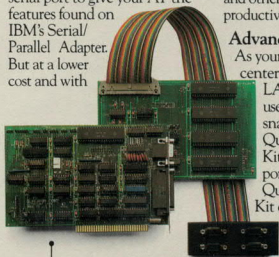
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Quadmeg-AT: RAM expansion from 128K to 2Mbytes. Expandable in 512K increments. Split memory mapping assigns 128K or 384K to base memory.

Total RAM Capacity: 4Mbytes.

Expansion Cards: Two cards available. Each comes with 512K or 1Mbyte RAM installed.

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CIRCLE 486 ON READER SERVICE CARD

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CIRCLE 107 ON READER SERVICE CARD

Esther Dyson to Head New Computer Daily



Esther Dyson

NEW YORK—One of the computer industry's leading prognosticators and analysts, Esther Dyson, will head a new international, electronic computer publication designed to expand the breadth and depth of industry coverage. *Computer Industry Daily (CID)*, set to begin publi-

cation this summer, will be available on-line with a hard copy backup. It will be published by Ziff-Davis Publishing Company, New York, and distributed through MCI Mail.

Dyson, now president of EDventure Holdings, Inc., editor of the *RELease 1.0* (which will be absorbed into *CID*) newsletter, and host of the annual Personal Computer Forum, will be editor and publisher of the new publication. In addition to late-breaking industry news, *CID* will report on related hardware, software, marketing, and finance issues.

CID will be Ziff-Davis's first new publication since selling off its noncomputer consumer, special interest, and business properties earlier this year. Ziff-Davis also publishes *PC Magazine*, *PC Week*, *Creative Computing*, and *Digital Review*.

—By Charles Bermant

22 New IBM Titles Ready

WALLINGFORD, Conn.—IBM has released a second batch of Personally Developed Software, adding 22 new packages to its collection of low-cost programs, most of which were written by IBM employees on their own time.

The programs, listed below, fall into several categories, or families.

Entertainment:

Crypto-Mania Puzzle Pac \$14.95
(requires *Crypto-Mania* \$19.95)
Liptocoe \$19.95
Music 101 (Trivia from Mozart to Motown) \$19.95
Scattergrams \$19.95
Trivia 102 \$19.95

Education:

Adventures with Whole Numbers \$24.95
Private Tutor Presenter 1.1 \$19.95 (lets you run Private Tutor lesson programs but not au-

thor them, as with *Private Tutor 2.0*)
FORTAN Tutor \$19.95
Multiplication Tables \$24.95 (requires *Private Tutor*)

Productivity:

DB/Editor/Writer \$49.95
DOS File View \$19.95
FileCommand II \$19.95
INFOPC \$39.95
Personal Print Control \$29.95
Short Hand \$14.95
SuperC \$19.95
Utilities III \$19.95
(SORT, LOADRAM, SAVERAM, COMPARE, ERRORLOG, PATCH)
Word Proof II \$39.95

Programming:

DOS Enhanced DEBUG \$24.95
Object Library Maintenance \$19.95
Structured Assembler Translator \$34.95

Business:

Member Services \$29.95 ■

PC UPDATE by VIRGINIA DUDEK

NEW YORK - Borland International of Scotts Valley, Calif., has announced Version 3.0 of Turbo Pascal, which now operates at twice the speed of 2.0. "It's the fastest compiler in the solar system, probably even in the galaxy," claims Philippe Kahn, Borland's founder and president. Version 3.0 uses "turtle" graphics for the IBM version. Appearing as a triangle on the screen, the "conceptual" turtle replaces vectors and pixels. The upgrade includes optional binary coded decimal (BCD) support, a re-worked input/output procedure, a memory mapped editor, and a new manual.

Version 3.0 now runs on a wider range of MS DOS, PC DOS, CP/M 80 and CP/M 86 machines. Current users can upgrade to 3.0 by trading in their 2.0 disk for a \$39.95 credit, or the original 2.0 disks with 8087 support for a \$59.95 credit. The trade-in is being offered direct from Borland through June 1, 1985. A special new buyer price of \$69.95 will also be offered through June 1.

Kahn gave substance to the rumors of a Borland 1-2-3 clone and says that Borland plans to have compilers for BASIC, C, and Modula-2. Stay tuned.

Let's clear up what MicroPro of San Rafael, Calif., is planning for WordStar. Despite a less than perfect reception to WordStar 2000 and user's fears that their old favorite is being phased out, president Glen Haney promises revisions and a long-term commitment to the original WordStar. "The market should understand that we're building another product, not replacing one," says Haney. MicroPro envisions a three-tiered market for a full line of word processors that includes WordStar 2000 at the high end, WordStar in the middle, and a third as-yet unannounced product at the low end. "Our intent is to have three products on the best seller list," says Hanes.

"WordStar is also evolving to a more transportable code base," adds Haney, noting that it's now written in C and Pascal instead of the original assembler.

Some short takes: Clarity Software, based in Austin, Texas, has released version 2.0 of 3-2-1 GO, a program that converts Lotus 1-2-3 and Symphony spreadsheets to models and data files for Execucom's Interactive Financial Planning System. Current users can obtain 2.0 for free...Power writers can replace the old MaxThink for the new version, 2.1, free of charge. Improvements include command additions such as write, view, directory, divide, join, and headings....Lotus announced an updated 1-2-3 Graphics Printer Library II, with 10 new drivers for printers and plotters including the HP LaserJet, HP ThinkJet, and IBM color graphics printers. It replaces release 1A. Updates are available only through Lotus dealers.

Be a contributor to PC Update. Write or call Virginia Dudek, PC Magazine, One Park Ave., NY, NY 10016, (212) 503-5265.

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100 ea. DISCO, 48 Trk	\$ 149
1000 ea. DISCO, 48 Trk	\$ 959
DOUBLE-SIDED, DOUBLE DENSITY	
COC, 10 ea. DISCO, 40 Trk (IBM, HPI) 5	\$ 23
100 ea. DISCO, 40 Trk (IBM, HPI) 5	\$ 285
OVSIAN, 10 ea. DISCO (IBM, HPI) 5	\$ 35
MAXELL, 10 ea. DISCO, MD2 (IBM) 5	\$ 25
VERBATIM, 10 ea. DISCO, MD24 (IBM) 5	\$ 29
HIGH DENSITY DISKETTES FOR IBM-AT	
MAXELL, 10 ea. DISCO (IBM-AT) 5	\$ 77
MEMOREX, 10 ea. DISCO (IBM-AT) 5	\$ 84
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90 day "No hassle, money back guarantee."	
100 ea. DISCO, 48 Trk (IBM, HPI)	\$ 95
250 ea. DISCO, 48 Trk (IBM, HPI)	\$ 229

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DOT MATRIX:	
EPSON, R300 + F/T - Invt or tractor	\$ 369
FX80 - 160 cps/80 col.	\$ 309
FX100 - 160 cps/108 col.	\$ 349
JX80 - Color Printer, 160 cps	\$ 799
LQ100 - 200 cps DQ & 47 cps LQ	\$ 1395
MANNESEMAN-TALLY	
Sprits-80 - 80 cps/80 col.	\$ 269
MT180 - 160 cps/80 col.	\$ 799
MT180 - 160 cps/132 col.	\$ 1099
ORDATA, Okumura 20 - Color, Hi Res 1	\$ 268
82A - 120 cps/80 col/pa.	\$ 349
82A - 120 cps/132 col/pa.	\$ 749
84 - 200 cps/136 col/pa.	\$ 999
92 - 160 cps/80 col/pa.	\$ 499
93 - 160 cps/136 col/pa.	\$ 799
2419P - Pacemaker350 col/pa.	\$ 2995
STAR MICRO, 5010 - 100 cps/100 col/pa.	\$ 299
5015 - 100 cps DQ, 30 cps N/L, 80 NEW	\$ 499
5010 - 160 cps DQ, 40 cps N/L, 80 NEW	\$ 449
5015 - 160 cps DQ, 40 cps N/L, 80 NEW	\$ 599
SR10 - 200 cps DQ, 50 cps N/L, 80 NEW	\$ 549
SR15 - 200 cps DQ, 50 cps N/L, 80 NEW	\$ 679
THERIBA, Prop. spacing & hi res graphics	
1351 - 180 cps (DQ) & 100 cps (LQ)	\$ 1895
1340 - 144 cps (DQ) & 54 cps (LQ)	\$ 995
Bi-directional Tractor Feed	\$ 195
LETTER-QUALITY:	
JUKI, 6300 - 600 cps	\$ 995
6100 - 18 cps/80 pitch	\$ 599
6300 - Prop. spacing & hi res graphics	\$ 995
1351 - 180 cps (DQ) & 100 cps (LQ)	\$ 1895
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MONITORS

AMSEK, Color 300 Comp/160	\$ 349
Color 500 Comp/VCR/RGB/Audio	\$ 525
Color 600 Hi Res, RGB/Audio	\$ 599
Color 700 Ultra Hi Res, RGB	\$ 749
Color 710 Ultra Hi Res, Phos	\$ 799
3000, 12" Green	\$ 599
300A, 12" Amber	\$ 199
310A, 12" Amber (IBM)	\$ 259
PRINCETON, HX-12, Hi Res, RGB	\$ 795
SR-12, Hi Res, RGB	\$ 799
Scan Doubler for SR-12	\$ 249
MAX-12, Amber (monochrome)	\$ 249
Quadchrome 12" RGB Color	\$ 259
Quadchrome 12" RGB Color	\$ 495
Quadchrome 12" RGB Color	\$ 650
Quadchrome 12" RGB Color, Hi Res	\$ 1995
ZEMITH, ZVM22, 12" Amber	\$ 139
ZVM123, 12" Green	\$ 149
ZVM124, 12" Amber	\$ 200
ZVM125, 12" Color	\$ 599

MODEMS

ANCHOR, Signamax Mark II (IBM)	\$ 299
HAYES, 2400B External Modem (IBM)	\$ 899
Smartmodem 1200B (IBM)	\$ 549
Smartmod II Software (IBM)	\$ 149
Smart Chronograph (RS-232)	\$ 249
Smartmodem 1200 (AT or Smart)	\$ 569
NOVATION, J-Cat, 300 Baud Modem	\$ 149
ACCE3, 14.4 Kbps Modem + Cables	\$ 395
PROMTECH, 1200 Standalone Modem	\$ 495
Modem 1200B (IBM)	\$ 399
QUADRAM, Quadmodem, Internal (IBM)	\$ 425
Quadmodem, External (IBM)	\$ 495
VERTEL, PC Half Card (IBM)	\$ 549
300 Plus, External (IBM)	\$ 499
PC 1200, Internal (IBM)	\$ 499

ACCESSORIES

CURTIS, Diamond, 6 outlets, switched	\$ 50
Emerald, 6 outlets, 6 cord	\$ 60
Ruby, 6 outlets, 6 cord, filter	\$ 90
Sapphire, 3 outlets, w/line	\$ 52
INNOVATIVE, Flip-Flop 50 (disk holder)	\$ 22
KENDRINGTON, Masterpiece (IBM)	\$ 149
Printer Stand	\$ 30
NETWORK, Wireless, 4 outlet, w/lt & surge	\$ 70
Wireless Plus	\$ 100
PRICO TECH INT'L, Uninterruptable Power Supply	\$ 229
300 Watts, XT300 for IBM-PC	\$ 359
300 Watts, AT300 for IBM-AT, 72 lbs	\$ 379

Desperately Seeking Sales

BY CHARLES BERMANT

COCONUT GROVE, Fla.—Personal computers have boosted the sales of everything from art to zippers, but the machine's potential to improve sales training remains untapped.

Jack Levine, president of Thoughtware, concedes that not everyone is cut out for the high-pressure sales world. Levine has borrowed the concepts of the Thoughtware's popular management training software and developed a sophisticated program geared specifically toward increasing the productivity of salespeople.

Introduced at press conferences prior to Softcon, *Sell, Sell, Sell* is a two-part, multi-disk package designed to train salespeople and chart the

main of training seminars, which can cost companies upwards of \$500 per person. While gaining in popularity, these intensive sessions are often too much to take in one sitting. Furthermore, says Levine, "The biggest bugaboo is that people forget. If they want to remember what they've learned, they have to go back to scribbled notes on scraps of paper."

Sell, Sell, Sell focuses on how the sales representative uses the sales process. The program contains a self-assessment and an analysis of the user's necessary sales personality traits, including the ability to deal with rejection and make effective small talk with prospective clients. It also features an on-disk counselor that evaluates why a particular sales call might

ing in educational planning.

The 13-part *Management and Diagnostic Training System*, priced at \$3,995, is an all-purpose package which offers computerized advice in subjects ranging from personal interaction styles to stress management.

A majority of Thoughtware's 110 employees have psychology, sociology, or business backgrounds, with experience in the development of training programs that don't incorporate computers. In addition to its retail software, Thoughtware has developed customized PC programs to suit the needs of specific companies.

When asked to project the most optimistic sales figures for *Sell, Sell, Sell*, Levine said that 100,000 application and 30,000 training packages could be sold in the next year.

Birth of a Program

Sales isn't like child-rearing—there's not much dispute as to which procedures work best. Differences in technique usually boil down to semantics. For the substance of the program, Levine says he drew from "an amalgam of what was there," using input from ten different consultants.

The training portion resembles a slideshow, turning the PC into a desktop multimedia center. The content combines common sense and sales philosophy, putting the user in mock sales situations and giving immediate feedback to the chosen option. Even the best salesperson will make some errors. As one Thoughtware employee says, "If someone gets every question right, there's something wrong with the program."

"Transference is the biggest problem, applying the 'for example' situation to the real world," says Levine. "After a seminar, people go back to their old ways. But this program reinforces effective sales techniques on a day-to-day basis."

"We've seen a good response to the program so far.

The sales process is ripe for this kind of innovation. It's an inefficient process that hasn't been addressed by the computer."

Upending the Apple Cart

Unlike past Thoughtware programs, *Sell, Sell, Sell* is only available for the IBM PC and compatibles. The company has discontinued all of its Apple offerings because, according to Levine, "we are going after a strictly business market and there is no Apple in business. The business world is an IBM-compatible world." The program is targeted to those who already are using a PC in some other capacity.

At an average price of \$450,



Jack Levine

Thoughtware's products are high-end. While Levine acknowledges that the product price may drop slightly as the installed base grows, he does not believe there will be an across-the-board nosedive in software prices.

"Software costs must pay for product development," he says. "We compare the cost of this package with the cost of the alternative ways of accomplishing what the software does. These programs have a higher inherent value than just efficiency increase. They can increase effectiveness four or five times."

"In the past, sales has been untouched by technology. It's said that sales talent is a mystique—you either have it or you don't. That's only partially true."

progress of their newly acquired knowledge. The training program measures the "desire to sell" that is essential for successful salespeople, while the applications portion helps implement strategy and provide day-to-day support of efficient sales techniques.

"Computers have been used to improve things like production or inventory control," says Levine. "In the past, sales has been a hand-crafted process, untouched by technology. It's said that sales talent is a mystique: you either have it or you don't. That's only partially true. Not everyone can be a great salesperson, but this program can bring everybody's skills up a notch."

Theory to Go

Most of what *Sell, Sell, Sell* is trying to accomplish has, up to now, been the nearly private do-

have gone badly.

In large corporations, Levine says, the program can be used to supplement, rather than replace, group instruction, giving the company the opportunity to "add specific training and corporate razzmatazz." As for smaller firms, most have no formal sales training programs and can't afford to take their employees away from the selling process. In this environment salespeople can use the software as a self-paced program.

Levine is neither a salesman nor a programmer. He holds a Ph.D. in economics and has spent most of his career in the area of training and development.

In addition to founding Thoughtware in 1983, he also started two other companies, the Higher Education Management Institute and the Systems Research Group, both specializ-

"We decided waiting another decade for the standard in business software was too long."

Instead, Macola, Inc. has taken the Standard in Business Applications Software for *minicomputers*, from MCBA,[®] converted it to R/M COBOL for 16-bit computers, and created, we believe, the *Micro-Standard*.

Hundreds of microcomputer business applications packages from scores of programmers were rushed to market during the last ten years as the microcomputer became an everyday business tool.

Many were fine packages—filling niches, stop-gapping problems, allowing the businessperson to *maintain*—probably not drop behind, but definitely not surge ahead.

What was missing from these packages varied from package-to-package. Some lacked power. Some, simplicity. Others, clarity. Most lacked real integration.

Introducing Some *Old* Software

During those ten years, Mini-Computer Business Applications, Inc. (MCBA), was quietly establishing the standard for Business Applications Software for minicomputers.

Today, much of the new software developed by other companies boasts compatibility with MCBA's packages.

Macola, Inc., finding the current micro-packages unacceptable against the standards they sought, and realizing the time

involved in developing their own set of packages, approached MCBA, obtained the rights to convert the powerful minicomputer software, then did just that.

Thanks to Macola, the microcomputer industry can now run the *Micro-Standard* in the following financial software...

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CIRCLE 263 ON READER SERVICE CARD

DOWN TIME BY WINN L. ROSCH

Floppy Flings: The Good, the Bad, the Dime-A-Dozen



Were I to exchange my vestments for something in plaid, bury my tongue with a brogue, and trade my harpsichord for bagpipes, I might find it easier to accept my nickname, "Scotch."

Just because I've memorized every discount ad in the back of *PC Magazine* and can recite the issue, page number, and price of every bulk offer of floppies I come across doesn't mean I am unduly frugal, however. I'm merely thrifty and I don't believe in paying for what I don't need.

Yet, while I do buy in bulk and forthrightly balk at laying down more than a buck per floppy, I find myself reaching for a brand-name disk when I need to save something important. Perhaps you too harbor a similar paranoia, fostered by double-truck ads warning of the horrors of trusting your valuable data to a two-bit disk.

What? Me Worry?

You know the plea: A premium disk costs only a few bucks, and that's small change compared to the time, effort, and slavery spent filling all those magnetic bytes with your numeric knowledge and words of wonder. So why not pay an extra dollar for a disk with a gold label and buy a good night's sleep? Why tempt misfortune with disks that may be dizzying-ly close to defective?

Because not everything I do has to be engraved in stone, that's why. Sometimes I put a single file on a disk and mail it away to a magazine in a distant city to be translated into a column. It doesn't matter if my text gets garbled along the way, because any random words that appear are indistinguishable

from my normal writing style. Sometimes, too, I find that the disk I use to save my position in *King's Quest* just might not be worth a king's ransom.

More importantly, I've learned the greatest secret of the computer world, one that some disk salespeople are rumored to take an oath not to reveal: One floppy disk is very much like another. Behind the various brand names might lurk exactly

passes on the topside, it will likely be thrown into a big box marked "single-sided." But because rejects alone can't fill the world's need for one-sided disks, you can reap the benefit. When you buy single-sided, bargain-basement disks, you can just shift the burden of testing from the manufacturer to your own PC.

Even if a disk has a bad sector, you lose only a tiny fraction

cutting measures can result in substantial savings. Now comes the paranoia. The similarity between disks is only under the skin, and the differences may be enough to keep you up nights.

The quality of disk jackets and liners (the unwoven cloth that cushions the disk inside the jacket and continuously sweeps dust and grime from the disk surface as it spins) can differ markedly between brands. Some liners are specially lubricated. Some jackets are specially sealed to prevent you from pulling out your read/write heads with the disk. In fact, many big-name manufacturers are confident enough to guarantee that their disks will last longer than your PC.

Furthermore, despite the similarity between single- and double-sided disks, double- and quad-density disks are not so closely related. Higher storage densities require different (and more expensive) oxide formulations, which you probably discovered the first time you wanted to get cheap with the disks you fed to your AT.

Moreover, according to the official factory pronouncements, the disk makers' certification process is much more stringent than the DOS quick FORMAT test. This helps insure against future errors.

Something inside me—the paranoia—says that there just might be something to this certification stuff, so when it comes to important data, I still prefer to consign it to one of the few expensive, gold-labeled disks that I've picked up here and there over the years. You can never be too safe, even when your soul has a yearning for the Highlands, briar pipes, and a round at St. Andrews. ■

I've learned the greatest secret of the computer world: One floppy disk is very much like another.

the same magnetic medium.

Making the actual disks inside those square plastic jackets requires expertise and huge factories of specialized equipment. Consequently, you can count all the world's manufacturers of the magnetic media used in floppy disks on your ten digits.

Looking At Both Sides

Another secret—one that you may have discovered inadvertently—is that every floppy disk you're likely to find has two sides, no matter what the label says. Whether you buy single- or double-sided disks, all look the same to the DOS FORMAT command. Almost all floppies will format two sides if you order your PC to do so.

The only difference between most single- and double-sided disks is called certification—the test process. Single-sided disks are tested only on one side; double-sided disks get checked on both sides. Cheap disks may not get tested at all.

You can bet if a disk takes the double-sided test and only

of total disk capacity when a flaw is found. Unlike early CP/M computers, which summarily reject any disk with a single bad sector, PC-DOS merely marks ailing sectors as bad when the disk is formatted. Thereafter, your PC never sees or uses the bad sectors.

Safe with this knowledge of the inner similarity of disks, you may want to follow my cost-conscious ways and cut all the corners you can on the floppy disks you buy. My cent-saving strategy is to buy disks in bulk, 50 to a package at a buck a piece or less. As soon as I get them, I format each disk. Those without errors get a stick-on green dot (which also helps me instantly distinguish formatted from unformatted disks). Those with one or more bad sectors get a yellow dot. When a magazine like *PC* asks me to send copies of a story, I send them on the disks that earned green dots.

Looks Are Deceiving

If you go through a lot of disks, you'll find that such cost-

TAPE IT EASY.

Boy, are you in for a surprise. You know you need mass storage. And you know you need some kind of backup.

But what you don't know is that making a backup from your hard disk can take the patience of a saint. And tax the memory of an elephant.

Unless, of course, you have a little TLC. The new TrimLine Combo from Corvus. You get mass storage (20 Mbytes). The incredible speed and efficiency of a hard disk. And an integral tape backup.

But there the similarity between a Corvus and anything else ends.

First of all, your TLC fits in beautifully. Between your IBM PC's monitor and base. No bulky boxes. And no clumsy cables and wires to trip over.

Next, you get the world's easiest tape

backup system. If you like using command lines, fine. The TLC will accommodate you. But if you're more interested in simplicity, just use one of the TLC's menus. And one of your fingers.

You can back up the entire disk. All your data for the day. A group of selected files. Or just one single file. As a matter of fact, you can back up whatever you want. Which will save you quite a bit of time and aggravation.

You'll also find backed up files in seconds with the TLC's Directory. No more searching an entire tape just to find one file.

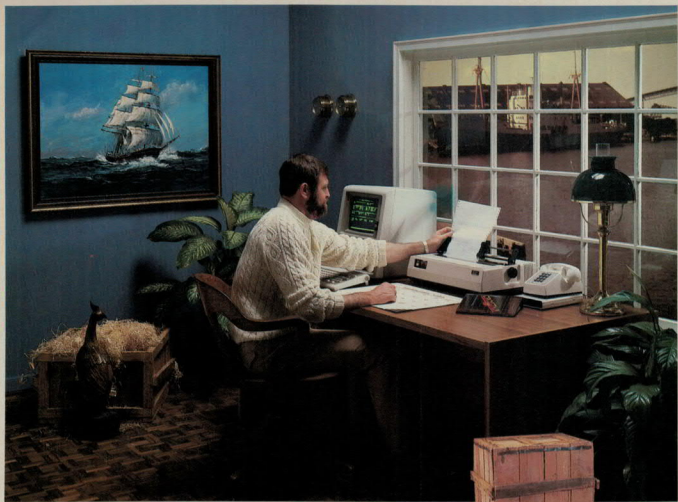
Finally, you'll enjoy the backup speed of the TLC. There's no formatting of blank tapes (which can save you about two hours). And no worry about losing data to bad sectors the format has called good.

Scared? Don't be. Just tape it easy. Check out the TrimLine Combo from Corvus.

In addition to all the features, it's one of the lowest-priced tape backup systems you can find.

For more information and the name of your nearest Corvus TLC dealer, call (800-4-CORVUS).





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CIRCLE 326 ON READER SERVICE CARD

DAVE ERICKSON, JOHN HILD: The First XyWriters

BY JOHN DICKINSON

When Dave Erickson bought an IBM PC for home use 2 years ago, he wasn't sure what he was going to do with it. However, he was sure that he didn't like the DOS EDLIN line editor. Then a systems programmer with ATEX, Inc. of Bedford, Mass. (a front-end composition service for computerized typesetting systems), Erickson set about writing a better, full-screen editor using IBM's Macro Assembler. "I had to put up with EDLIN just long enough to make my editor work. Then I junked it."

Erickson showed the product of his new found hobby to fellow ATEX employee John Hild, who starting thinking entrepreneurial thoughts. "There's always a place in the market for a good word processor," says Hild, and Erickson's editor was faster and more responsive than any he'd seen on a PC. They soon left ATEX to form the XyQuest Corporation, dubbed their new editor *XyWrite I*, and set out to further develop and market the product.

Speed and responsiveness were the key objectives for *XyWrite I* and its *XyWrite II* successor and they remain critical today. "Any end-user product has to be written in assembly language in order to be fast enough to satisfy today's demanding PC users," says Erickson. XyQuest went farther than many software developers by writing custom keyboard routines that process keystrokes faster than the PC's BIOS routines can.

But XyQuest's commitment doesn't end there; it goes right out to *XyWrite* users. "No fea-

ture request comes in that doesn't get evaluated for inclusion in the current or next version of *XyWrite*," according to Erickson. Still a small company, nearly half of XyQuest's employees are there to provide users with telephone support.

Occasionally a user will be surprised by a call from Erickson himself. When Richard Milewski was unhappy with *XyWrite* and wrote *PC Magazine* a letter about it, a response came from Erickson himself, who called and resolved his questions. More frequently, Erickson gets involved when a user has inadvertently trashed a

(VARs) to tailor the program for specialized vertical markets. Most important for the VARs is the *XyWrite* programming language for writing macros. "Most of the value-added resellers just have to add their own macros to customize the product," says Erickson.

XyQuest still aims for the speed and responsiveness of the original product, but the company's present priority is to develop higher levels of word processing sophistication to satisfy the growing demand for features. "We want *XyWrite* to be the word processor of choice, the top of the line," Hild says.

"A word processor should be able to put anything on paper you want to have there."

file. "We can usually save the file if the user hasn't switched the machine off by the time he calls."

XyWrite has been significantly upgraded in its 2-year life. There have been two major version releases and a seemingly endless stream of revisions. It's now called *XyWrite II-plus* and boasts a wealth of sophisticated word processing features including multiple indexes, automatic table of contents generation, on-page footnotes, mail merge, microspaced justification, and a unique fill-in-the-blank mode for typing on pre-printed forms.

Going Vertical

XyWrite can be customized at almost any level and for almost any purpose, which has made it easy for value-added resellers

"Ultimately," adds Erickson, "a word processor should be able to put anything on paper you want to have there."

"That means combining speed and power with ease of use, in a package that can do things no one else can do," says Hild.

Getting Going

XyWrite is known for its speed, but many people find its commands difficult to use. "That only goes for the first 2 hours or so, while you're learning to use a product," responds Hild. "After that, *XyWrite*'s commands are much easier and faster to use than a menu-oriented word processing system, and that's when your productivity really counts."

XyQuest's continued success



John Hild (left) and Dave Erickson (right).

with *XyWrite II* has inspired Hild and Erickson to work hard to bring a more sophisticated version, *XyWrite III*, out by the third quarter of this year. One of the new features will be proportional spacing with microspaced justification, which will allow mixing of font styles and sizes on a laser printer, multiple-column formatting, and predefined style definitions.

Major parts of *XyWrite* are being redone for the upcoming version to make it easier to use and even more flexible. Editing page headers, footers, and footnotes will be easier. A better on-line help facility and an on-screen tutorial are also in the works, along with entirely new documentation and packaging.

XyQuest's long-range plans for *XyWrite* are ambitious and call for improved database facilities, graphics merged with text in printed documents, spreadsheet-like calculations, and telecommunications directly to and from the word processing environment. In spite of these far-reaching plans, Hild and Erickson don't plan to convert *XyWrite* into an integrated product (like *Symphony* and *Framework*). Instead, they envision bringing their speedy word processor closer to Erickson's objective of a program that gets "anything you want on paper."

Picks and Pans On Disk Deals

THE SHORT REPORT

BY PHIL WISWELL

As with all of IBM's Personally Developed Software programs, the packaging for *Member Services* comes with no description, and its title may lead one to suspect it's a program designed to keep track of church affairs. In fact, *Member Services* (IBM Personally Developed Software, Box 3280, Wallingford, CT 06494; for the PC, XT, or AT; \$29.95 plus \$2.95 postage and handling; requires 192K RAM, two disk drives, and DOS 1.1 or above) is a customer billing, recordkeeping, and report management program that handles up to 600 accounts.

The disk includes 17 pages of clear documentation, well organized into a step-by-step procedure. From the main menu you can add, change, delete, or review client files, change your list of services and charges, or enter into one of three submenus. The submenus let you create and print billings and detailed reports according to a wide variety of criteria. The program inserts names in the salutations of bills, includes up to 20 lines of text with a breakdown of the charges, and even prints mailing labels.

Hired Handlers

If you never move files into the current subdirectory of your hard disk and don't keep multiple copies of files in different subdirectories, then you don't need to know about *FloatFiles* (KD Ware Computer Services, Box 712, DeKalb, IL 60115; for the PC and XT; \$29.95 including postage and handling; requires 128K RAM, DOS 2.x, and one fixed disk drive).

The company calls it a set of fixed disk organization tools, but its major intended use is more specific. Let's say you bought your hard disk to group data from accounts payable and

accounts receivable in separate subdirectories. This cuts confusion, but it doesn't address a key problem: Many applications can use data only from the current subdirectory. *FloatFiles* solves that. You code all files necessary to run *WordStar*, for example, then import them to any subdirectory with the single-word command GET followed by the code. It's a "quick and dirty" solution.

You don't need *FloatFiles*

asterisks you can follow from one section to another. The modular design helps you query and graph data quickly.

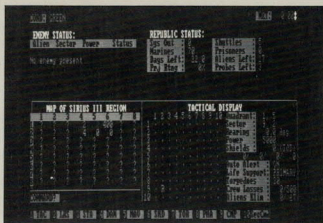
No matter what software you use to track your money, wouldn't it be nice if you could dump the contents of any screen—text or graphics—to a dot matrix printer? You can with *Print Screen* (Domus Software, Ltd., 303 Waverly St., Ottawa, Ont., Canada K1P 0V9; \$50 plus \$3.50 postage and handling; for the PC and XT; requires 20K RAM and DOS 1.1 or higher). For example, it lets you do screen dumps inside 1-2-3. Once booted, the program remains dormant until you invoke its capabilities, which include printing any

give a Nobel Prize to *Star Fleet I* (Cygnus, Box 57825, Webster, TX 77598; \$49.95 plus \$2 postage and handling; for the PC and PCjr.) Basically, it's like many other computer space war games. You have just so much power to use for fuel, shields, torpedoes, and phasers while moving through the sectors of the galaxy in search of enemy ships. So the real strategy of the game lies in strategic planning and efficient use of energy.

Star Fleet I isn't bad, but don't expect the first-person battle perspective you'd find at the arcades. The screen presents a lot of information, and only a small portion is dedicated to a gameboard no more graphic than Battleship played with paper and pencils. The 100-page manual is accompanied by a 65-page *Officer's Academy Training Manual*, which led me to believe it might be easier to master *Framework* or *Symphony*.

Most PC software for young children suffers because the "wrong keys" keep getting in the way. One program claiming a "child-proof" interface is *Mother Goose* (Sunstar Systems, Route #4, Box 368, Ogdensburg, NY 13669; for the PC, XT, PCjr, and Tandy 1000; \$34.95 plus \$2.50 postage and handling; requires 128K RAM, DOS 2.x). The subject matter—nursery rhymes set to music—is presented with color graphics and animation, and I invited my 3-year-old son John to participate.

After opening BASICA.COM to the disk, I booted the program to a colorful title screen, which stayed there. John pressed a key and we saw a picture of a boy sitting on a large bird. John pressed another key and we advanced to the first nursery rhyme. To shorten the tale, *Mother Goose* is pretty, but it's just a slide show that we both tired of after one viewing. Press any key to advance to the next screen; press the space bar to go back. That's interaction? As for the "child-proof" keyboard: John held his finger down a bit too long once, and we watched all 25 slides go by in a flash. My advice: Buy the book and read it to your child. ■



A screen display from Cygnus Software's *Star Fleet I*.

with 1-2-3 because that program lets you call files from any hard disk directory. What you might find a useful adjunct to 1-2-3 is *Gray Matter Ledger* (The Write Place, Inc., Box 5059, Littleton, CO 80123; \$75 plus \$1.50 postage and handling; for the PC and XT; requires 384K RAM and 1-2-3). It's a personal finance template to track five income and 20 expense categories for 12 months, with a section of totals for 12 years.

Account Ability

The spreadsheet is large enough (A1-BX317) to require a map to facilitate moving among its eight sections—input, output, data queries, monthly and yearly totals, bank statement reconciliation, help file, and macro file—but the template also contains trails of

combination of character attributes (normal, bold, reverse video, underline), in black and white, color, or negative image, in varying sizes oriented in either direction, and intended for correct centering.

It sounds like a dream come true, and it is if you have one of the dot matrix printers that *Print Screen* supports. IBM/Epson compatibles are no problem, but the list of 18 other supported printers has not actually been tested by Domus. The list was compiled from printer manual specifications. However, the folks at Domus seem very obliging, and will probably be helpful both before and after you buy.

Star Wars

If awards were given for ripping off themes, I'd have to

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CALENDAR

JUNE

2-5

Consumer Electronics Show sponsored by the Electronic Industries Association's Consumer Electronics Group. Will feature exhibits, workshops, seminars, and conferences. To be held in Chicago, Ill. Contact: Consumer Electronics Show, 2001 Eye St., NW, Washington, DC 20006, (202) 457-8700.

17-19

PC Expo

Will feature hardware, software, accessories, and conferences. To be held at the New York Coliseum in New York City. Contact: Steven Gross, 333 Sylvan Ave., Englewood Cliffs, NJ 07632, (201) 569-8542, (800) 922-0324.

24-26

Videotex '85 sponsored by Online Conferences Inc. Conference and exhibition featuring videotex manufacturers, business, and consumer applications. To be held at the New York Hilton in New York City. For more information contact Online Conferences, 989 Ave. of the Americas, New York, NY 10018, (212) 279-8898.

JULY

15-18

The National Computer Conference sponsored by AFIPS, Association for Computing Machinery, Data Processing Management Association, IEEE Computer Society, and Society for Computer Simulation. To be held at McCormick Place in Chicago, Ill. The theme for the conference is "Technology's Expanding Horizons." For registration and information call (800) NCC-1985.

AUGUST

19-20

Future Computing's Graphics Forum and Seminar. To be held at the Hyatt Regency Embarcadero in San Francisco. Overview and forecast of personal computer graphics marketplace. Contact: Future Computing, Inc., 8111 LBJ Freeway, Dallas, TX 75251, (214) 437-2400.

NOVEMBER

14-16

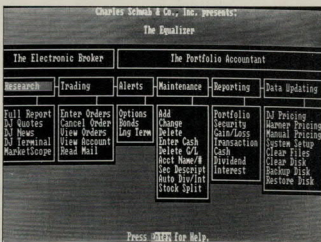
Corporate PC Conference. To be held at the Los Angeles Airport Hilton in Los Angeles, Calif. PC hardware and software for large- and medium-sized corporations. Contact: Data Processing Management Association, P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

Charles Schwab Launches Two Financial Programs

BY ROBIN WEBSTER

SAN FRANCISCO—Discount stockbroker Charles Schwab & Co. is attempting to tap two powerful images—equality and independence—with the intro-

Warner Computer Systems stock quotes (15-minute delay or real-time), trade stocks through the Schwab computer network, and receive automatic notification of important events (such as the deadline for exer-



duction of its first software packages for individual investors.

One program, called *The Equalizer*, is intended to make individual investors feel as if they are on the same footing as the Wall Street pros.

Professional investors have almost immediate access not only to the usual stock market quotations, but to more comprehensive information sources that determine whether they buy, sell, or sit tight. Schwab's idea is to allow individual investors to use *The Equalizer* to access such highly regarded services as Standard & Poor's MarketScope, which is updated continuously during the day.

"This is a first for the individual investor," says Bill Gillis, head of Schwab's Technology Services group. "The S&P service is a very powerful market intelligence/analysis tool that has previously been used primarily by professional investors. Now, it is one of the major services that will give our customers a total investment picture."

Equalizer users can also access the Dow Jones and/or

cising a specific stock option, or a reminder that a certain account is about to roll over).

The Equalizer costs \$199 and was developed in cooperation with Teleware Software. You'll need 128K RAM on your PC-XT.

Financial Independence

The second program announced by Schwab, temptingly called *Financial Independence*,

offers a range of personal financial planning facilities. The many-featured program, which retails for \$299, operates on an IBM PC-XT or compatible with 256K RAM.

"We spent a long time evaluating personal financial programs already out on the market—we looked at maybe 50—but we didn't see anything suitable for our needs," says Gillis. So, in the end, we decided to develop our own unique package."

Financial Independence, which was actually written by Multisoft Corporation, has four major components: a budget manager, stock investment manager, financial goals manager, and a tax estimator.

The budget manager can keep track of up to 150 accounts and, like the stock investment manager, will automatically transfer tax-related information to the tax estimator section of the program. The financial goals manager seems geared to reducing some of the stress usually encountered when trying to compare loan types and options.

To assess how much tax you'll have to pay on your hard-earned profits, the tax estimator records all tax-related data from the other modules, and allows you to play "what-if" games with the data. Although similar to a spreadsheet in concept, the program manipulates tax data using on-screen representations of major tax schedules (including the 1040). ■

Finishing the Symphony

CAMBRIDGE, Mass.—Lotus Development Corporation recently announced two *Symphony* add-in products that help fine-tune and enhance its best-selling integrated software package.

Symphony Spelling Checker and *Symphony Text Outliner*, both designed to enhance *Symphony*'s word processor, represent the beginning of a planned series of *Symphony* add-ins that will soon be available to consumers. The spelling checker

features the 80,000-word Merriam-Webster dictionary and an optional British word list. The text outliner add-in integrates an outlining function into *Symphony*'s word processing module. It automatically creates a table of contents for a finished document and reorganizes the subheads and text when you reorganize the outline's main headings.

The spelling checker requires a minimum memory of 512K of RAM and two disk drives. The text outliner requires 384K and two disk drives. Each requires *Symphony* and both retail for \$139 each.

—By Virginia Dudek



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CIRCLE 275 ON READER SERVICE CARD

Company Offers FREE OVERNIGHT DELIVERY!!!

New customer service policy expected to set a new standard in the mail order industry!

BY MICHAEL CHRISTOPHER

GARDEN CITY, N.Y.—Mr. David W. Pasternack, President of Logisoft, a major IBM PC software and hardware distributor, has announced the inception of a unique new customer service policy. . . free overnight courier delivery on their entire product line.

In a recent interview, Mr. Pasternack stated that "We feel our new free overnight delivery service will set a new standard in the computer software mail order industry. In a study we conducted, we found that in addition to competitive pricing, expedience was a factor utmost in our customer's minds. Whether their order was \$300 or \$3000, the need to get their package as soon as possible was the same. Under our old procedures, between processing and shipping time, it could take up to a week and a half to two weeks for an order to arrive. With our new courier service, an order can be processed, shipped, and arrive in our customer's hands in only 3 working days. . . at no additional charge!"

The company is using Emery Worldwide to handle the large number of packages being shipped each evening for next day delivery. "We chose Emery for their competitive pricing structure and excellent delivery record", said Mr. Pasternack. Emery was quoted as saying, "This makes Logisoft the largest single Emery account in the New York Metro area.



LOGIC TIP OF THE MONTH

Choosing software can be mind-boggling. With the proliferation of publishers, how do you choose. Analyze your needs. . . what specific tasks do you want to perform. Read the software reviews; an excellent way to evaluate a package. Ask around. . . you'd be surprised how many associates may be using a package similar to your application. Finally, choose the best package (not always the most expensive). Upgrading will end up costing you more. Remember the key word is research.

TOLL-FREE SUPPORT A Smashing Success

GARDEN CITY, N.Y.—A survey of Logisoft's toll-free technical support policy was done to see if it warranted the continued costs of the 800 toll-free number, personnel costs, etc. After careful monitoring of these calls (both pre-sale and after sale) it was found that 92% of the calls were for legitimate technical support questions rather than for answers already contained in the softwares' operations manual. As a result of the survey, the decision has been made to continue toll-free support as an important part of their customer service.

This service consists of assisting with:

- Hardware requirements
- Initial boot-up procedures
- Initial software configuration (printers, disc drive, etc.)
- Back-up procedures
- Defective program determination
- Alternative program recommendation
- Return policy

Logisoft's Lowest Price Guarantee Still Effective

GARDEN CITY, N.Y.—Logisoft, Inc. has indicated that their long time policy of guaranteeing the lowest prices in the mail order market is still being offered and will not be affected by their new free overnight delivery service. "We will continue to beat any price by \$10" a company spokesman said. "We'd be crazy to fool with success", he stated; "since the inception of our lowest price guarantee, sales have skyrocketed."

When asked how Logisoft could afford to give their customers free overnight delivery plus beat any price by \$10, they replied "Buying Power". "Very simply", they said, we buy at the best possible prices and pass those savings along to our customers".

CONTINUOUS STATIONERY: BIG BUSINESS, But "Where's The Class?"

NEW YORK—The growth of Logicforms, Inc., a member of the Logic Group, has been phenomenal. Mr. Ralph Corso, President of Logicforms explains why. "Up until now, buying continuous stationery through the mail has been a take what's available situation". "First off", he said, "almost all mail order firms offer only stock letterheads & envelopes with limited typestyles, colors and stock logos from which to choose, but, 'where's the class'?"

"The individual style and design of a letterhead", said Mr. Corso, "reflects the professionalism and personality of a company and should not have to change because they now have a printer and the need for continuous stationery. While other mail order firms are limited in the variety they can offer, Logicforms specializes in custom stationery. Logicforms offers a large selection of quality paper, ink colors and special effects such as thermography, blind embossing, foil stamping and multi-color printing." Mr. Corso went on to say that

"whether a customer chooses to supply his own artwork or printed letterhead, or wishes to select from our vast array of stock designs. . . We are the Logical Choice".

For a free sample/pricing kit and a handy re-usable shipping envelope for artwork, simply call toll-free 1-800-645-3491 or send a sample of your current stationery for a free firm price quote. Mail to Logicforms, Inc., 300 Garden City Plaza, Garden City, N.Y. 11530

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Multimate	\$269
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PARITY CHECK BY STEPHEN MANES

Junior and Edsel: Two of A Kind Together At Last!



Now I know what it must have felt like to own an Edsel. I am the disheartened owner of a product whose announcement was anticipated with reverence, whose introduction was greeted with ridicule, and whose demise was cited as proof of the sagacity of the American public. I refer, of course, to the PCjr.

Sure, my discontinued Junior will take me as far as it ever could, but now everybody on the block snickers when I take it for a spin. "Poor guy," folks chuckle. "And he still thinks people will take his pitiful scribbles seriously?" It's a little like reviewing Maseratis for *Car and Driver* while tooling around the neighborhood in a '59 Rambler.

Well, snicker those who will. Owning Junior has taught me many significant lessons about the world of computers. Let's hope the industry has learned them, too.

• What's in a name? Plenty!

The perfectly charming sobriquet "Peanut" captured the public imagination and garnered millions of dollars of free publicity before the product's introduction. But no. Many Big Blue suits were evidently stuffed with the offspring of egomaniacal parents who'd foisted their monikers upon the next generation, thereby creating monsters bent on a form of public revenge. (Trivia addicts will recall that the Edsel was named for a son of Henry Ford.)

But who wants a junior anything? Would you puff with pride of ownership boasting about your subcompact Mercedesjr, your minisupercomputer Croy-1jr, or your condo in the Ritzjr?

• Don't let product designers steal the show.

The Edsel's most evident feature was its infamous "Ford-sucking-a-lemon" oval grille. Junior's was its "bloody Chiclets" keyboard. Neither machine ever recovered from arrogantly putting its most egregious design error right up front.

IBM's replacement keyboard had a better look and feel, but its dumb two-press (Fn, then a number) function key surrogates appeared on only one other machine I can think of, which turned out to be the only other giant 16-bit home computer flop, the TI 99/4A.

• Don't play games with essential "options."

IBM stole a page from the auto industry's old pricing practices—a dangerous move in these days of well-equipped Japanese imports. Since the advent of the original PC, base prices have always been tailored to sound extremely attractive—until you discover the machine will barely get you out of the garage. The original plain-

vanilla PC, for example, included a grand total of 16K RAM and a cassette port. Every other form of mass storage and I/O was an extra-cost option.

Junior carried this insanity to new depths. The low-end model had only 64K, a version of BASIC that didn't take advantage of any of the machine's advanced features, and no disk drive. It was good only for playing the half-dozen games available in cartridge form and teaching the buyer how to install all the essential "extras" he should have bought in the first place.

The enhanced model had lots of built-in stuff—all with catches. The printer port worked only with a third-rate thermal device, and a standard port went for a hundred smackers. All the rest of the connectors were flimsy nonstandard Berg models that required \$25 cables to become accessible. And adding memory or a disk drive to a typically configured system required an expensive auxiliary power supply.

Even the infrared keyboard wouldn't work straight from the box. As PC contributor editor

Winn Rosch has noted, "Junior is probably the most expensive product sold with the famous legend, 'Batteries not included.'"

• Don't tax the engine beyond its means.

I don't think this was one of Edsel's problems, but it sure was with Junior, whose designers forced the poor 8088 microprocessor to work double overtime. Because the machine lacked Direct Memory Access circuitry (a chip or three to share some of the work), the 8088 was forced to run the video display, the disk drive, the keyboard, and the communications port all by its lonesome.

It sometimes protested vocally. Attempts at typing during a disk access set the machine chirping like a demented sparrow. And trying to download incoming communications directly to disk called up unfortunate memories of Charlie Chaplin's final freakout on the assembly line in *Modern Times*. You half expected to see the 8088 marching in front of the machine with a picket sign reading "UNFAIR!"

Any microprocessor can be pushed beyond sensible limits. Extra points for further research: check out the Motorola 68000 as used in the Macintosh.

On the other hand, look at it this way: Ford made parts for the Edsel for a while, and IBM will keep your Junior on the road. It won't ever run like an AT, but it ought to keep getting you where you want to go.

And who knows? In 20 years, you may be able to swap that original high-style chiclet keyboard for some other gorgeous deco item—like, say, an Edsel grille. ■

Art for NEC's Sake

"The medium is the message" is one expression advertisers would do well to heed, because the medium used in an ad sometimes carries a message that works against the interests of the advertiser.

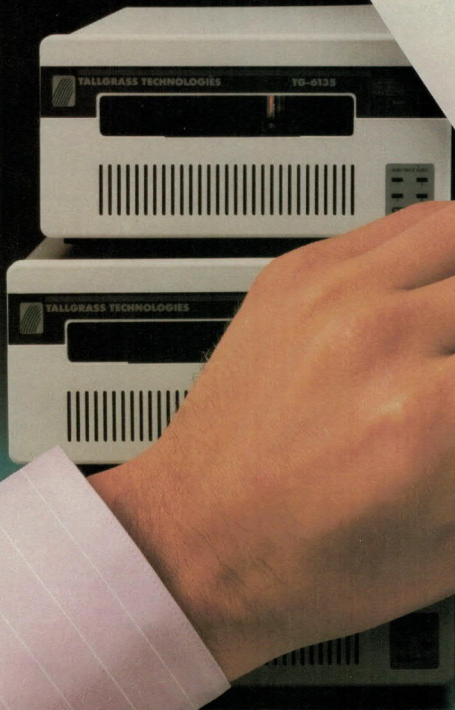
Consider this exhibit: A colorful spread that NEC recently ran in *Fortune*. Its centerpiece is a graph with bands of five colors, depicting NEC's growth from 1980 to 1984 in the areas of computers and communications.

The ad's verbal message was: "The new information age is built on C&C, the merging of computers & communications." But what catches the eye most is that this simple graph was rendered for NEC as a painting, signed by Kenneth Noland, an artist noted since the 1950s for his hard-edged geometric style.

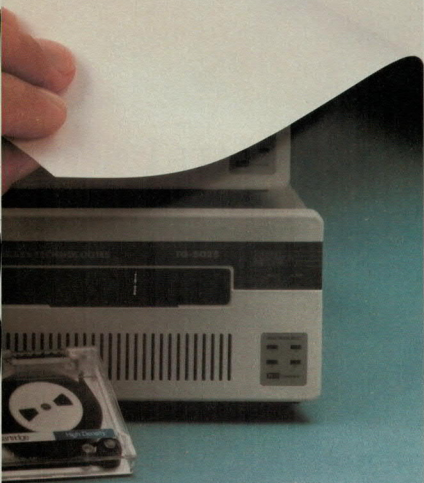
An NEC personal computer could have produced the graph for far less than Noland's fees. What's the matter NEC? Don't you trust your own computers when you have to communicate a message? ■

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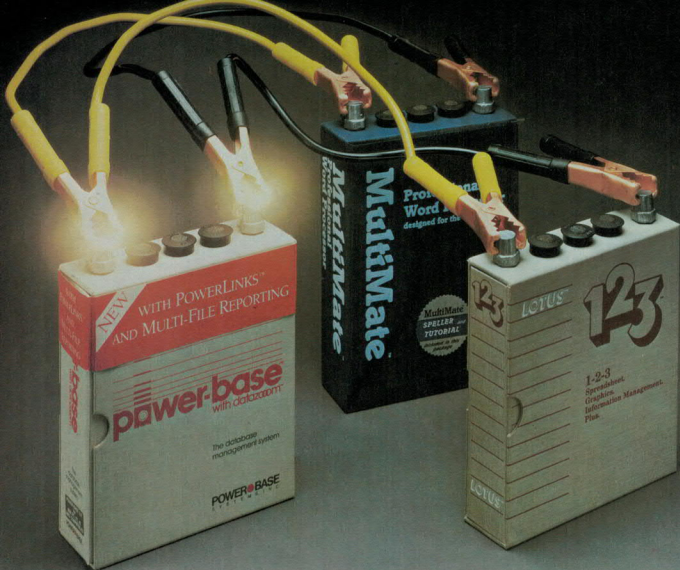
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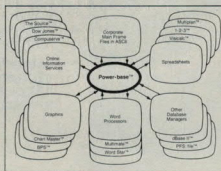
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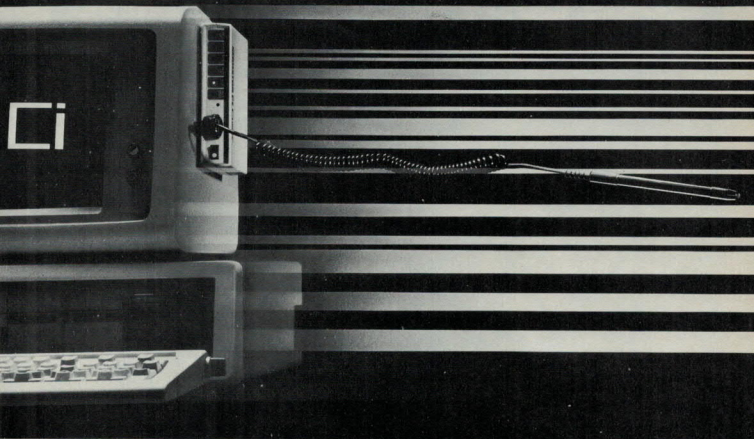
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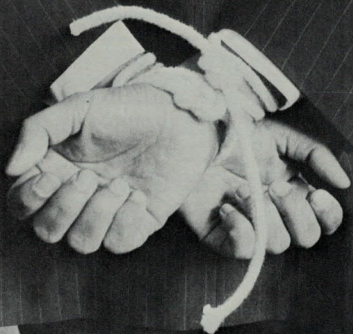
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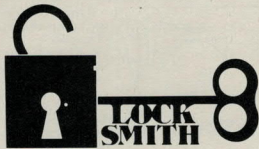
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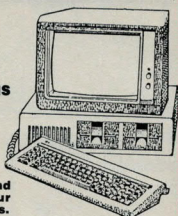
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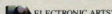
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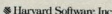
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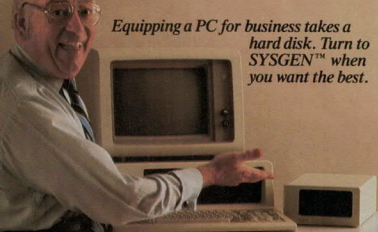
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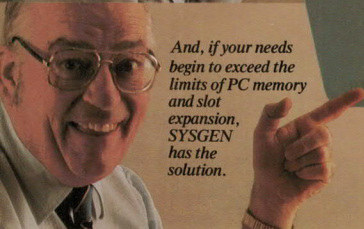
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Interactive Reader Update

PC Magazine's new Interactive Reader Service bulletin board is an unmitigated success—thanks to you. In response to your suggestions, we'll be implementing several new features.

PC Magazine's Interactive Reader Service is off to a flying start—nearly 100 callers a day during the first few weeks. We started out with just the Programming columns, added some User-to-Users, some Spreadsheet Clinics, backloaded some other big macros, and now we're sailing. And we'll be happy to listen to your suggestions on which of the older programs and things to put on the board. We put the index to PC Volume 3 up there already. Many readers have requested an index; PC-IRS to the rescue! Now you can download the index if you really want it. We may eventually put up a program that allows you to search the index on-line.

PC-IRS has also been a fantastic conduit for information from you to us. We've gotten hundreds of messages from readers: good suggestions, editorial comments, User-to-Users, pleas for help—the works. A surprising number of you placed your very first modem call to our bulletin board, got the hang of it, and called back for downloads. For those of you who have trouble with file transfers, we're working on a feature article that will describe how to use our system with a number of popular modems and communication programs.

Several PC-IRS users suggested that we put up an electronic version of PC News, with fast-breaking stories and the text of press releases as we receive them. It's not a bad idea, but I wonder how often you would call, and why. After all, the PC News section closes a month later than the rest of the magazine, so the breaking news is typically only a few

weeks old. Do you really need it sooner than that? There are other sources for the kind of fast-turn industry news that some of you need. It's easy for a magazine to try to be all things to too many kinds of people. Something generally suffers for



Bill Machrone

it. Still, I'd be interested to hear other opinions on this subject.

Any Messages?

A number of callers have also suggested that we make PC-IRS a full-blown remote bulletin board system (the software we are using is based on the public-domain RBBS) that allows users to leave messages for one another. My feeling is that there are more than enough boards that serve this purpose, locally and nationwide, maintained by dedicated sysops. Our objective is to communicate magazine-to-reader and reader-to-magazine. We're not looking to go into com-

petition with CompuServe, The Source, or any PC-oriented user groups. Besides, any time we spend monitoring your back-and-forth communications is time stolen from bringing you new articles and items of interest. Therefore, there will be no full message system.

A few users have asked for an 800 number for PC-IRS. Well, the caller log shows that nearly everyone is calling from work or at least during business hours. Your messages indicate that many of the downloaded programs will be used to benefit yourselves at work or your employers. Given the heavy business and professional bias of our readership, that's hardly surprising. So I view your use of PC-IRS as a business-to-business transaction and certainly worth the expense.

One thing we'll try to spare you is the need to continually call the Interactive Reader Service just to see what's new on it. We're working out the details of a section in PC News that tells you what's been added.

Comparison Test

Head-to-head product testing is a vital part of PC Magazine, one that consumes an unbelievable amount of time and expense. Not that all the expense is ours—you're putting a lot of dollars on the line, checking out new products. In some cases, you're relying on a manufacturer's good name, hoping that the next product will be as good or better than the last one. Other times, you read the reviews, compare notes, and draw your own conclusions. From now on,

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you'll find all of our benchmark tests on PC-IRS, complete with documentation files and some sample results. Armed with these resources, you can evaluate new products on your own and make val-

id comparisons to our published results.

One of the more interesting benchmarks to come our way was written by CORE International, Inc., a value-added PC dealer in Delray Beach, Florida. It

simply measures the track-to-track and average seek time of a hard disk. Its purpose is to weed out some of the junk drives that are currently finding their way into the PC AT supply stream. Too many users have no way of knowing whether the drive they just bought actually meets AT specifications. This program cuts through the baloney and gives you the hard numbers. It's now on PC-IRS. I hope that it will be disseminated through user groups and bulletin boards and put to good use.

Sympathetic Vibrations

Speaking of interactive readers, we hit some kind of nerve when we first ran the Spreadsheet Clinic in the early part of this year. Our first shot at a User-to-User approach for spreadsheets was a two-issue experiment, to take your pulse and gauge your interest. Well, you just about blew out our sphygmomanometer, responding with an incredible wave of submissions. We're glad to provide a forum for interchange on this critical application of personal computing. Although this field is dominated by 1-2-3, don't be shy about telling us how to make any spreadsheet or integrated package work.

You'll be pleased to know that contributing editor Jared Taylor has agreed to edit and test the submissions to Spreadsheet Clinic. Jared has considerable depth in the world of corporate finance and banking and does not present-value calculations during breakfast—in his head. Meanwhile, if you've found an impressive shortcut or discovered a way to do something that they said couldn't be done, send us your submission. Remember, you can submit your gems on disk or through PC-IRS. Both are eligible for the \$25 disk bonus because they save us the trouble of rekeying.

Et Cetera . . .

Are there any other topical areas that you feel are right for a forum or formal interchange in *PC Magazine*? Databases? Graphics programs? It's almost silly to ask, because you, as a group, have never been shy about stating your preferences. That's why it's such a pleasure to put this magazine together for you, the interactive reader. ■

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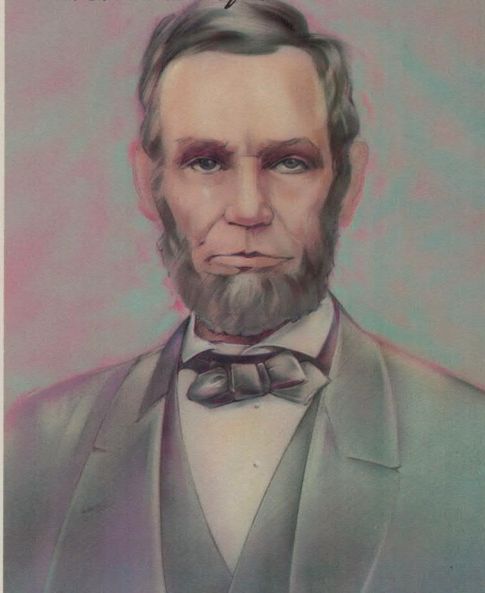
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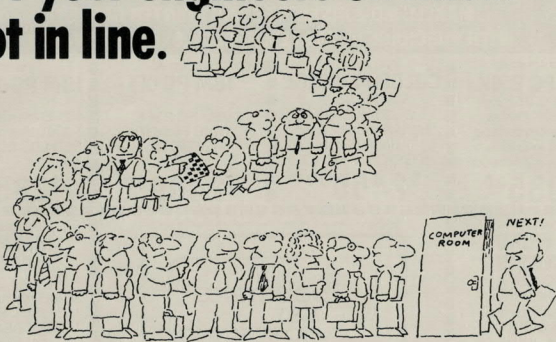
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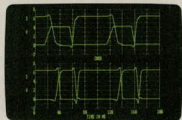
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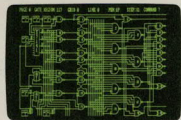


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Technical Bulletin

No. 2 in a series.



SUBJECT: Engineering a LAN for Maximum Flexibility.

Quantum Software Systems Ltd. proudly announces QNX 2.0 — the Ultimate Distributed Network Operating System. QNX 2.0 is now available for the IBM-PC, IBM-AT, PC compatibles, DEC Rainbow and TANDY 2000. If you have been waiting for a Real-time Multi-tasking Multi-user Operating system with fourth generation LAN support, then QNX 2.0 can offer you today what the competition can't even begin to promise for the future.

QNX 2.0 integrates the Local Area Network architecture right into the heart of the operating system, at the fundamental level of intertask communication allowing tasks to communicate transparently with other tasks across the whole network. This means that any task (program/application) may access ANY serial port, ANY printer or ANY disk on the network. There are no artificial restrictions. Every PC with a disk is a potential file server. PCs without disks will automatically BOOT over the network.

QNX on the IBM-PC AT:

QNX is the first Multi-tasking Multi-user Operating system available for the AT. It is available in both networked and single machine configurations. At about 2.5 times faster than the QNX 8088 PC based systems, and 10 times faster than other multi-tasking operating systems on the same processor, QNX is the ideal program development environment.

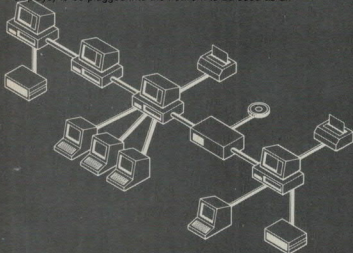
O/S	Computer	Processor	Measured time
QNX™	IBM-PC AT	80286	480 usec
XENIX™	Intel-286	80286	4,930 usec

File Security:

Designed with extensive file security features, QNX 2.0 provides long protection with network wide file permission checking based on 255 groups of 255 users. In addition, each PC user may control network access to devices attached locally to their machine.

Distributed Processing:

The QNX LAN supports distributed processing as well as distributed devices. Tasks may be executed on remote stations as easily as they may be executed on the local work station. This allows pure processing elements (PCs without keyboards or displays) to be plugged into the network to be used as an



un-committed processing resource. This is ideal for real-time, process control, data acquisition and data communication applications.

Global Communications:

QNX supports a full implementation of X.25 allowing connection to public networks such as Telenet and Datapac. This allows you to link geographically separate LANs together providing true global area networking.

Cost Effective Growth and Flexible Solutions:

QNX is affordable, and will work with the PCs you use today and those you will use tomorrow. You may mix and match different brand PCs on the same QNX network with absolute ease. Multi-user expansion may be accomplished by adding terminals to PCs or PCs to the network. You can start your multi-user application on a single PC with 1 to 10 attached terminals. Once your single processor starts to show signs of degradation, add another PC and connect terminals to the new processor. If the disk becomes the major bottleneck, you may add hard disks to other attached PCs to distribute the processing. Applications which are very CPU intensive may wish to limit a single user to each processor and expand the system with low cost diskless PCs used as work stations. QNX does offer a truly cost effective and flexible solution to your applications needs.

Portability:

QNX 2.0 is portable. The operating system is independent of the physical local area network. It is available in a form suitable for porting to other 8088/8086/80186/80286 computers in the consumer, educational and industrial market place. QNX is ROMable and can operate in as little as 128Kb RAM.

DOS Compatibility:

PC-DOS version 2.1 can run as a task under the QNX 1.2 or 2.0 operating systems. QNX will also allow transparent access to the DOS file system partition and floppies.

QNX Products:

QNX Operating System	PC-DOS Emulator
Full Screen Multi-terminal Editor	Electronic Mail
Extended Utilities	Electronic Teleconferencing
C Compiler & 8086 Assembler	Full Screen Menu Developer
Basic Compiler	Isam File Utility
Qbol (dibol) Compiler	Networking Board
Text Processor	OEM Customization Kit
Real Time Spelling Checker	(to port QNX)

Established:

Quantum sold over 10,000 copies of its operating system during 1984, into all business systems environments, to developers of real time applications, government and educational systems, to software developers/integrators, universities and research establishments.



Moodie Drive, HiTech Park, 215 Stafford Rd.
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Letters to PC

Half-Way Connection

Werner Grunbaum's article, "Legal Connections," (PC, Volume 4 Number 4) suggests that using modems to transfer files between PCs in a legal office would be a good alternative to LANs. I see a problem in doing this because one user would have to interrupt another's work to send a file to him.

A better solution is to send the file by modem to a local remote computer service (RCS) company and let the other worker retrieve it at his convenience. This is an efficient medium for transferring files and messages between firms. A typical RCS or time-sharing service is able to support a variety of equipment and therefore can function as a versatile LAN with the advantage of being able to send messages and documents to receivers outside of the office.

James A. Mayer
Morrison, Colorado

Bulletin Board Search

I am interested in getting a list of bulletin board systems. Can PC offer any suggestions on how to get such a list?

David L. Salahi
Irvine, California

An on-line directory of bulletin boards is maintained by Public Access Message Systems (PAMS). It's available on CompuServe (MAUG XA4) and The Source (PUBLIC 112). Also, a sample issue of Plumb, a printed newsletter covering bulletin boards, is available for \$2 from Plumb, P.O. Box 300, Harrods Creek, KY 40027. PC Magazine will be publishing a comprehensive list of bulletin boards in the next issue.—Ed.

Tax Preparation Software

David Thraikill's review of *Your Income Tax* by the J. K. Lasser Institute is pretty accurate ("Software for 'Your Income Tax,'" PC, Volume 4 Number 7). The program is slow, the help function is

virtually useless, and the calculator is not as good as the one in Borland's *Sidekick*. But a few of his points warrant comment.

Concerning a capital loss on Schedule D, I think Thraikill fell victim to a circularity in the tax form itself (blame the IRS). Before entering a final value on Schedule D for a capital loss, the taxpayer



er must know his taxable income. This is partially determined by the size of the capital loss. So the program will not compute a final value for Schedule D until all the rest of the Form 1040 inputs are entered and calculated to obtain a tentative taxable income value. Once this is completed, the status line will say that the Form 1040 is complete, and the Schedule D calculation can be completed and automatically entered on Form 1040 to give the revised taxable income. The documentation does not mention this point.

As to whether this program or any of the other tax programs reviewed in that issue really make tax preparation easier or more efficient, I think the answer is the same for all of them. The real work of the tax calculation is assembling, collating, and interpreting the input data. If the

taxpayer has used a financial or budgeting program to organize his year-long data, the task may be easier. Otherwise, it's a struggle with or without these programs.

The real value comes later. An experienced taxpayer never signs and mails in his first calculations. In a few days, he'll remember new items or he'll learn something new that he'll want to incorporate. When these changes are made, these tax preparation programs can ensure that all the effects of the changes are considered and calculated.

Howard W. Kreiner
Bethesda, Maryland

No Laughing Matter

Thank you very much for "Kennedy's Corner" in PC News (PC, Volume 4 Number 7, page 69). It was the funniest part of that issue.

PC readers would probably enjoy Kennedy's wit if it were aimed at the software developers who have espoused copy protection and have threatened damage to machines running unauthorized copies. They are greedily protecting huge profit margins that will soon disappear as competition lowers the price of software to a reasonable multiple of its cost of duplication—just like books.

I wonder if Lotus or Ashton-Tate employees ever make photocopies of magazine articles and ads? Magazines are copyrighted too.

Keep up the good work.

Alexander V. Pinter
Columbus, Georgia

It is difficult to find words to express my appreciation and approval of Don Kennedy's reasoned and sane opinion expressed in "Kennedy's Corner." So many others would do well to emulate his exemplary tone. This is very productive work indeed.

James Pettit
Austin, Texas

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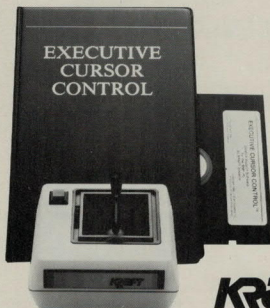
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LETTERS TO PC

Writers As Typesetters

I read the article "Typesetting for Writers" by Terry Ullick with keen interest (PC, Volume 4 Number 6). This is the

WRITING: TERRY ULLICK

Typesetting For Writers

Bypassing the manuscript stage is the wave of the future, and writers who learn the basics of typesetting can now electronically communicate their copy to their publishers and typesetters.



kind of article that I look forward to and appreciate.

I would like to find out more information about *High-Tech Typesetting* from Intergraphics, Inc.

Roy J. Washburn
Santa Barbara, California

The address for Intergraphics, Inc., is 106A South Columbus St., Alexandria, VA 22314, (703) 683-9414.—Ed.

Have Your Modem Call My Modem Editor's Note:

The following are some of the many messages we've had on PC Magazine's Interactive Reader Service. The number is (212) 696-0360. We welcome your calls and comments—they give us an idea of the types of things our readers are looking for.

I like the idea of being able to download program listings that have appeared in PC Magazine.

Tom Murdock
Houston, Texas

Thank you very much. This bulletin board is a terrific service.

Dan Mayer
Greencastle, Indiana

Congratulations on getting the bulletin board up and running. I am looking forward to being able to download the article index. If users are able to search for articles by key word, it will be very useful. A mailbox for messages to and from your staff would be nice also. Hope to see the bulletin board growing.

Charles Petzold
New York, New York

The bulletin board system looks really useful. I am curious as to what benefit the expert mode has. Other than that, everything is quite clear and simple to use. Thanks for your work.

Tom Martin
Brick, New Jersey

The User-to-User and Spreadsheet Clinic sections of *PC* are among the best parts of your magazine. I would be very interested in seeing programs from these sections available on this bulletin board.

Wes Jones
Wilmington, Delaware

I just wanted to let you know that I think this IRS is a great idea! I have never liked the idea of keying line after line of someone else's program.

Niel Wiegand
Austin, Texas

I really enjoy *PC* and look forward to reading it and browsing through the articles and advertisements. This IRS is a great way to get instant feedback from your readers. The Spreadsheet Clinic is a good start on a theme that can obviously be expanded to other areas. Sections in the magazine like this illustrate the growth of expertise *PC* users are experiencing. However, please continue to cater to both experienced and novice users. People can be knowledgeable in one area and not in others.

Jeff Kurpaska
New York, New York

This is my first time on *PC*'s Interactive Reader Service, and I think you have a great thing going. This shows me that *PC Magazine* is dedicated to its subscribers, and I for one will definitely be renewing my subscription. The magazine is good.

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Gary Gruber
Rancho Mirage, California

I just want to add my vote to the voices that have received this service positively.

David Welcher
Brooklyn, New York

Correction:

Expert-Ease, an expert system reviewed in Volume 4 Number 8 ("Expert-Ease Makes Its Own Rules") is available from a third distribution outlet in addition to the two that were listed. It can be obtained from Jeffrey Perrone and Associates, Inc., 3685 17th St., San Francisco, CA 94114, (415) 431-9562.

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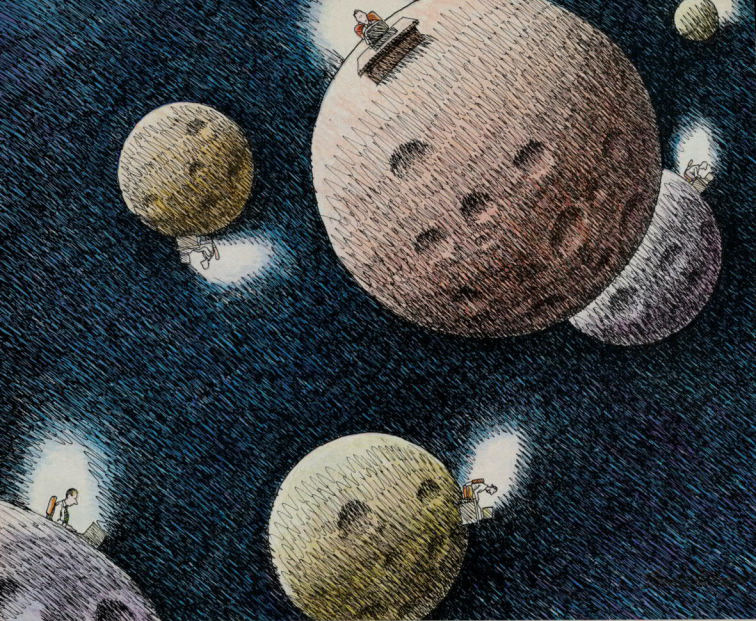
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Waiting for Good Print

The introduction of IBM's new printers, the Wheelprinter and Quietwriter Printer, seems to mark its entrance into the letter quality market. Norton takes a good look at the very flexible Quietwriter.

I suppose we're all looking for the perfect printer. If that seems like a pretentious, metaphysical statement, well, what can I say? I'm still looking for the perfect printer for my PC, and I've yet to find it. To heck with perfect; just satisfactory is hard enough to find.

As always, I'm a fan of IBM, and I was very interested when, some months ago, it announced a couple of decent-looking printers. Before this, all that IBM had offered for PC printers was a series of practical but crappy dot matrix printers. While the best letter quality printers there are—the NEC Spinwriters—got a sort of official seal of PC approval from IBM, that wasn't really enough. IBM's a class act, and it needed something better.

The New Printers

Enter IBM's dreadfully named Wheelprinter and Quietwriter Printer, two very interesting new printers for the PC family. I loved them on sight and immediately treated myself to a Quietwriter. There is a lot that I like about the Quietwriter, and this column should be taken as an extended sales pitch for it—I think you probably ought to get one. Even though I think you ought to get one, the main thing I'm going to talk about is the disturbingly long list of things I don't like about the Quietwriter. I'm going to tell you about what's wrong with it, so that when you get around to buying one you won't be disappointed with its flaws (as I was).

Despite the fact that IBM developed

several printer technologies, including the venerable Selectric golfball and the ink jet printer, the company has been hurting in recent years for anything up-to-date in either typewriters or small computer printers. It obviously noticed



Peter Norton

that fact and attempted to come up with a coordinated solution. Out came a series of three typewriters and two computer printers based on two different print engines. One engine is a conventional daisywheel, which is the basis for two of the typewriters and the Wheelprinter. The other engine is a technical innovation that in effect marries a thermal printer to a letter quality carbon ribbon. It produces remarkable print quality and is the basis for the third typewriter and the Quietwriter Printer.

The Quietwriter print mechanism basically melts a film ribbon of ink onto paper, noiselessly. Its print images are gen-

erated electronically, essentially as a super-high-resolution dot matrix impression (you can't see the dots). The result is that the Quietwriter can print the full PC font.

Paper-Handling Problems

While it's pretty terrific, there are some problems. One of them is that the Quietwriter and its Wheelprinter brother don't share the same paper-handling design. While the Quietwriter has the nifty printing mechanism, it's the Wheelprinter that has the slickest paper handling. In one tidy, compact, and elegant design, it handles single sheets, cut-sheet feeding, and continuous pin-feed paper.

The Quietwriter Printer, on the other hand, uses a large, clunky separate tractor mechanism to pin-feed paper. It plugs into the printer electronically—which makes taking it on or off more of a chore and changes the behavior of the printer in some annoying ways. People think that they can get along without using a tractor to feed continuous forms into their printers, relying instead on the rubber platen to run the continuous paper through without its getting out of alignment. That works on lots of printers, but the Quietwriter doesn't have a platen that's precise enough to work that way. With the Quietwriter Printer, you need the tractor, clunky or not.

The Quietwriter seems to print both quickly and quietly, but there is some disappointment here, too. Because of the fancy thermal/carbon printing process, it can only print left to right—not back and

forth the way most modern printers can—so all those nonprinting carriage returns slow down the printing speed.

The print speed is again compromised by the Quietwriter's ribbon-conservation

techniques. If it's passing over more than two spaces, the ribbon and print mechanism are lifted off the paper. This process makes a soothing but distinct noise, and it also considerably slows down the

printing. Not only does the print mechanism stop dead when the ribbon is moved on or off the paper, but it actually backs up slightly. All that motion slows things down. When I first test-drove the Quiet-

Print speed is compromised by the Quietwriter's ribbon-conservation techniques.

writer, it looked good printing out a paragraph of continuous text. But with anything discontinuous—like a column of figures, such as accounting or spreadsheet data—this beast really slows down. This can be a problem even with text—if you're having your word processor justify the text, it ends up with triple-spacing between words.

I quickly found out why the Quietwriter Printer works so hard to conserve its ribbon, though. It goes through them pretty fast, and, at about \$12 a pop, it isn't particularly cheap. Since this is a new printer technology, the ribbons are only made by IBM—but even when competing sources appear, the price isn't likely to be much less thanks to the high-tech elements embedded in the ribbon design. When was the last time you spent \$12 for a typewriter ribbon?

Font Cartridges

However, the biggest thrill and the biggest heartbreak come together in one special feature of the Quietwriter: its electronic font cartridges. There are four PC fonts available, plus numerous typewriter fonts, for \$50 each. Again, IBM is the sole source for these cartridges.

The four special PC fonts have the full 250-odd extended ASCII characters that your PC uses, so that you can print anything on the screen, including the box-drawing and other graphics characters, the card suits, and the happy faces. It's great to have a letter quality printer that can print all the PC characters. What's more exciting is that the Quietwriter can hold two font cartridges, so you can switch between them with a few simple printer control codes.

Now comes the heartbreak. Among

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NORTON CHRONICLES

the many available font cartridges, there isn't one that breaks out of the stodgy typewriter-face mold to give you a real high-quality typeset look. Here you have a printer that has the ability to produce any classic typeface that you see books printed in, and the unimaginative folks who produce these font cartridges give you the same old "blah" typewriter faces. It wasn't as if IBM were only making one or two cartridges so it had to stick to basics. IBM is offering plenty of font cartridges that give you just about every imaginable variation on a typewriter face—every variation, I'm sorry to report, but the one you really want.

No Italics

Now, if you've got a printer that has removable font cartridges, you'll be glad to have a little variety in getting different sizes, such as pica and elite, and different styles, such as Courier and Prestige. But if you've got two fonts on line at the same time, what do you really want that second cartridge for? To mix pica and elite? Who's kidding whom? What everyone wants for his second on-line font is italic, and it pains me to say that there isn't one Quietwriter italic font.

As I've said, I've found a lot of things to grumble about with the Quietwriter

With the Quietwriter Printer, you get true letter quality, the full PC character set, and no noise pollution.

Printer, and I haven't exhausted the list. There are a few annoying things, like the lack of a platen knob to let you quickly and easily adjust the paper. Instead you adjust the paper by taking the printer off line and pressing buttons to move the paper up and down—a petty nuisance, but still a nuisance.

A Quiet Winner

All problems with the Quietwriter Printer aside, you still get an unbeatable combination of true, honest-to-gosh letter quality, the full PC character set, and no noise pollution. Short of a high-priced

laser printer, you just can't get that combination in any other printer, period.

In the end, it's the quietness of the Quietwriter Printer that really does it for me. How can you live with the noise of a

conventional dot matrix or daisywheel printer when you're trying to get some work done? You can't, and that's the major reason why this printer is a real winner over its noisy competitors. ■

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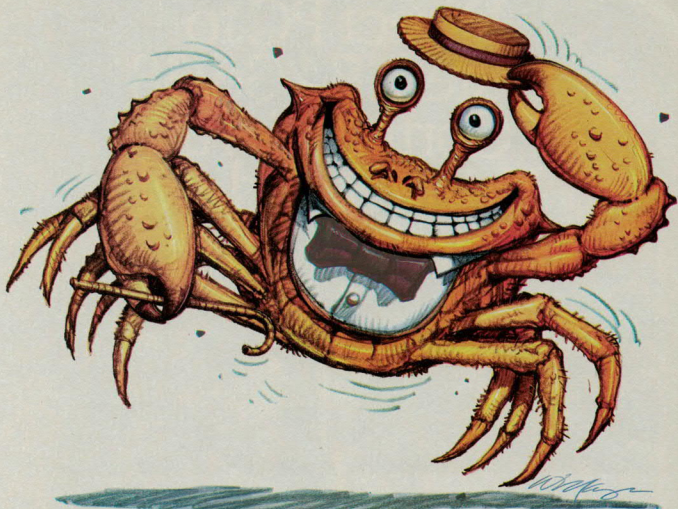
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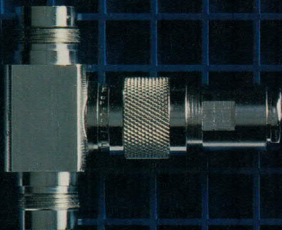
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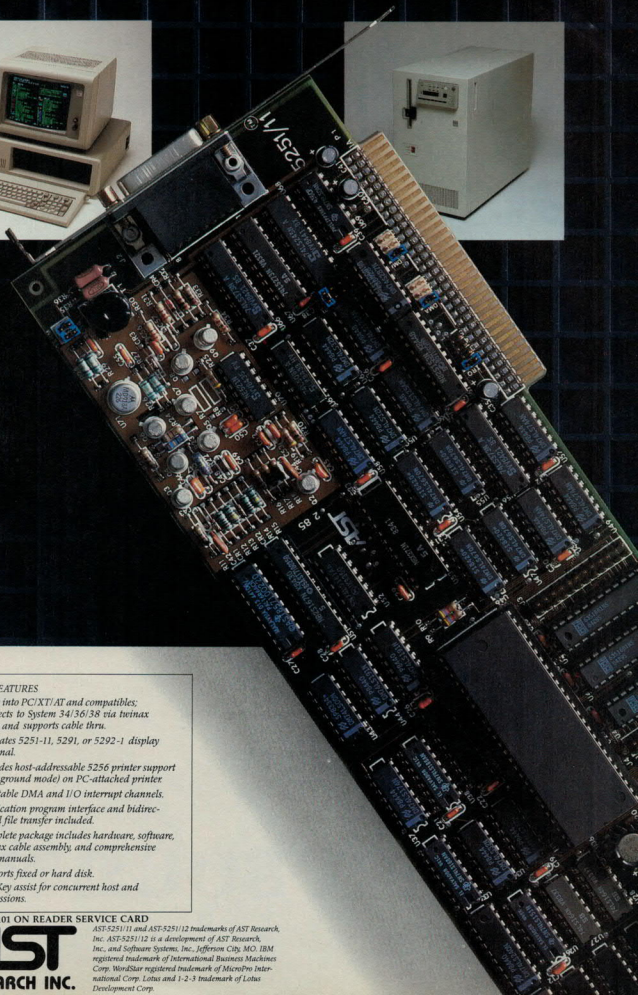
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Sooner or later, you'll have to face this computer problem.

PC MAGAZINE • MAY 15, 1984

Do your eyes itch, burn, or tear? Are they tired and sore? Do you get headaches, occasional dizziness, or blurred or double vision? If you have any of these symptoms, you're probably suffering from eyestrain and fatigue, and it may be from using your PC.

Eye fatigue and other vision problems are common for regular users of PCs and other kinds of video computer displays. This visual stress can also contribute to general tension and tiredness. Fortunately, vision problems experienced by video display users have

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Second, if computer users suffer, so does business.

Because computers are only as fast and accurate as the people who operate them.

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Which is why so many computers are technically impressive but strangely unnatural to use.

Computer-induced problems (%)

Eye strain	55%
Back pain	43%
Headaches	30%
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(Source: "Ergonomic Principles in Office Automation" Pub. 1983 by E.I.S. AB, Sweden.)

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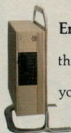
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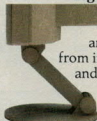
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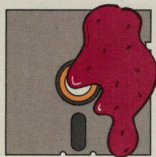
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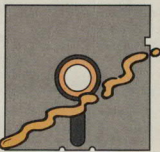
Clouds of smoke



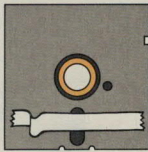
Maria's liquid cover



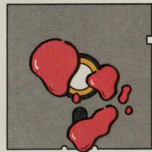
The big chill



Hot dog mustard



Tacky white tape



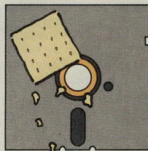
Lunchcounter ketchup



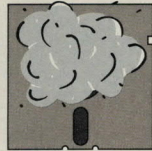
Potted plant—no pot



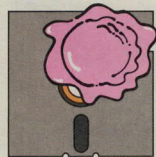
Fizzy orange soda



Cracker crumbs



Dust (cough-cough)



One scoop of ice cream



Sudsy soap bubbles



Chocolate fingerprints



Polaroid

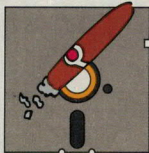
Perfect Data

10

d, your dog-eared, your mistreated:



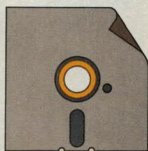
Dry martini, one olive



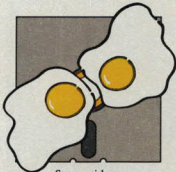
Boss's cigar ashes



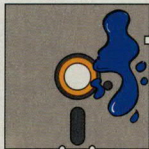
Spilled milk



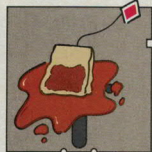
Dog-eared jacket



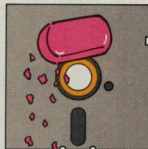
Sunny side up



Waterbased ink spots



English breakfast tea



Eraser bits

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THE GREAT SPREADSHEET



FACE OFF

One blustery Friday afternoon last February, 29 M.B.A. candidates from the University of Pennsylvania's Wharton School boarded cars, buses, or trains and headed for a weekend in New York City. All but a few had left their studies behind, and they spent most of the 2-hour trip thinking about favorite New York restaurants and night spots. Most looked forward to a fun weekend in the city; few were prepared for the grueling, 36-hour work marathon that lay ahead. The students had agreed to participate in an unusual event sponsored by *PC Magazine*, the Spreadsheet Face-off, in exchange for room and board at the Inter-Continental Hotel. Teams of

Pulling an all-nighter.



three students each (with one exception, a two-member team that had suffered a last-minute casualty due to the flu) would work out a series of business problems using an IBM PC and one of ten well-known spreadsheet programs.

The idea behind the competition was to test how quickly and how well a team of three bright, well-trained business minds could make each software package perform, given no previous experience with the package. The event and its results would help the PC staff evaluate the best-selling spreadsheet programs under the typical, stressful conditions of the business environment.

The list of the competing programs reads like a Who's Who of electronic spreadsheets, ranging from such perennial favorites as *1-2-3*, *VisiCalc*, *PeachCalc*, and *Multiplan* to the most recent releases: *Framework*, *Symphony*, *pfs:plan*, *SuperCalc3*, *Enable*, and *The Smart Spreadsheet*.

Each team received its package at Wharton a few days before the big weekend, but most of the teams were unable to practice with the software for more than a few hours, if at all. Wharton students are encouraged, but not yet required, to own a personal computer, and the ones who did own PCs didn't have enough RAM to run the programs anyway. In addition, the school's computer lab is stocked with DEC Rainbows, not IBMs. Thus, preparation was mostly a matter of reading and discussing the documentation and perhaps borrowing some time on a friend's IBM.

The Wharton School, which is part of the University of Pennsylvania, was selected by *PC Magazine* for its reputation as one of the top business schools in the United States, rivaled only by Harvard and Stanford. Only 4 of the 30 Wharton students who signed up for the face-off were women, though the women-to-men ratio at Wharton is twice that high. The consensus among the students was that although all Wharton students are competitive overachievers, men are more likely to want to prove their mettle in the public eye. The face-off was a chance to do so.

The series of business problems that awaited the students was designed by MicroTrek Enterprises, a New York City-

based consulting firm that specializes in training business people in the use of computers and business software. Ray Hood, one of the principals of MicroTrek, was on hand for most of the weekend, alternating as necessary among the roles of emcee, teacher, and friend to the students.

The competition got underway Saturday morning at 10 a.m. Along the oak-paneled walls of an Inter-Continental Hotel conference room stood ten long tables, each supporting a two-drive IBM PC, keyboard, color monitor, dot matrix printer, several blank disks, DOS 2.1, a pad of paper, some pencils, and one of the ten electronic spreadsheets.

After the students were settled in, they were asked to boot up their programs and await the first test problem.

A disk drive failed immediately, and *PC Magazine's* technical coordinator Mike O'Cone replaced it with the floppy drive from an XT system he had set up for *PC's* editors. Then a color board failed, and again it was O'Cone and the XT to the rescue. Within a few hours, the XT would be a cannibalized shell.

Adapting to the Programs

By 10:15, all ten computers were under control. Hood got everyone's attention and passed out photocopies of material for the first test: a blank income statement and balance sheet, followed by 22 pages of financial data.

Hood began, "Your superior has asked you to develop a general-purpose spreadsheet model capable of doing two things: analyzing historical financial statements and creating pro-forma financial statements." Calling attention to the company's two physical spreadsheet forms, Hood told the teams to first recreate the forms with their software, and to then use the templates to analyze the attached

"We've tried to keep it as close as possible to real-life situations," explained Hood about the tests, "and we are imposing time limits because we want to watch the students react under the type of I-need-it-yesterday pressure they'll find in the real world."

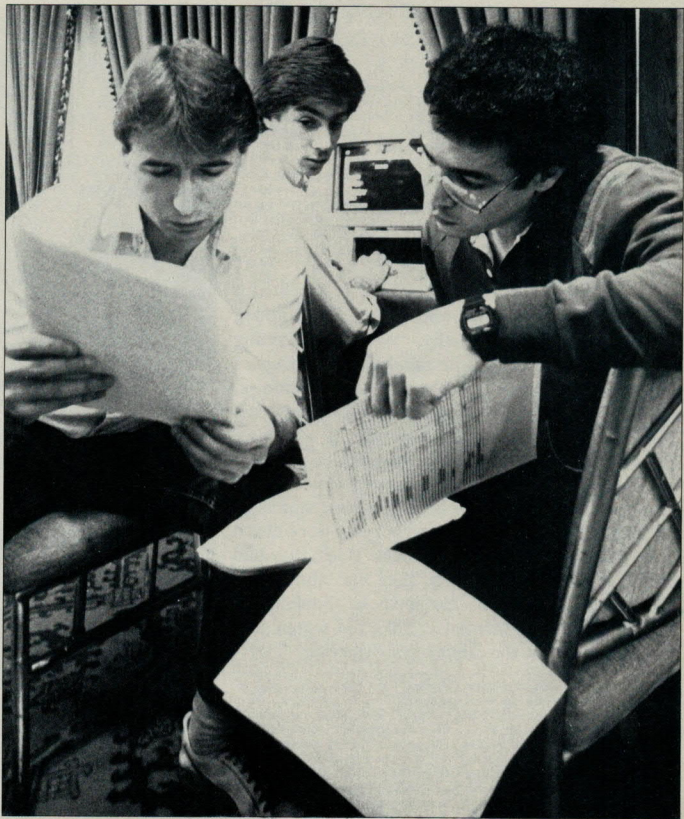
financial statements. A 1½ hour time limit was imposed.

Within 1 minute every keyboard in the room was tapping, and column and row headings began appearing on the displays. It was obvious that the students had done this kind of thing before, and a uniform strategy was adopted around the room. Each team placed its best typist or computer expert at the keyboard; a second person read headings and data aloud; and the third pored over the reference manual, looking for clues to the power of the team's software.

The *Framework* team had set up a programmable calculator alongside its PC until Hood showed up and told the three to put it away. "We're trying to judge your speed on the spreadsheet, not on the HP-12C," he joked.

Members of the *1-2-3* team, when asked as their work got underway whether they liked the spreadsheet, didn't bother shifting their eyes away from the screen, the manual, or the photocopied data that was already dog-eared from so much

To solve Problem 1, each team appointed one person to the keyboard, another to read data aloud, and a third to check the manual.



FACE-OFF

page-flipping. "Ask us again in an hour and a half," said Mike Crooks, dismissing both the question and the interruption. He turned to his teammate Walter White, who was frowning at the manual, and asked in annoyance, "How do you enter formulas again?"

The members of the *Enable* team looked as if they had just finished the marathon rather than just started, but their screen displayed fewer results than that of any team. All three had taken advantage of the night before to enjoy New York, and it was written on their faces Saturday morning. Rick Goe admitted their biggest problem at that moment: "We're hung over. We went to Rascals, McSorley's, Fitzpatrick's. Three bottles of wine with dinner.

We had a blast but we're paying for it now."

Dave Fricke described how his *pfs:plan* team was doing on the first test: "We haven't reached the point where we're having problems yet. Just entering information so far. This problem is mostly typing. It's a very straightforward, plug-in-the-numbers problem." *Symphony's* Craig Corelli had a similar reaction. "There's too much typing to do in this problem," he complained, sitting idly on the sidelines while his teammates entered information at the keyboard. "This is just number crunching. We do this all the time at school. The other problems will test our financial knowledge. This one is just testing the software and our typing ability."

Corelli's teammate Bob Blake added disappointedly, "We're not getting to use all the capabilities of *Symphony* here. We're not using windows, we're not using graphs. I want to get on to the other problems where we can use our creativity and our brains."

When the students were warned that only 5 minutes were left on the first problem, shouts of disbelief followed by loud sighs of relief were heard from the *Symphony* team members. When they had begun to print their results, they had almost lost everything because of carelessness. Said Craig Corelli of their performance, "We did a poor job. You might call it the *Unfinished Symphony*."

The *Multiplan* team also felt it had done poorly on the first problem, and Adam Gordon blamed it on the software. Was *Multiplan* so bad that his team didn't have a chance? Gordon thought over the question, then smiled and said "Well, they say that in his prime, Rod Laver could have won Wimbledon using either a squash racket or a frying pan!"

As Hood walked around the room

shouting "Print! Print!" many teams were still racing along the keyboard, their printers quiet. 1-2-3's Mike Crooks admitted his team's appreciation for the program, but could only find time and confidence to say "Let's put it this way—we wouldn't be printing now if we didn't have it."

Multiplan's Brad Lewis was probing inside his printer with a screwdriver. "Resetting DIP switches," he explained.



Ray Hood, one of the principals of MicroTrek, acted as teacher and friend to the students during the event.



FACE-OFF

"The driver from the program didn't work, but I have one of these printers at home.

The *PeachCalc* team was also scrambling to finish. "The big problem now is that *PeachCalc* won't let us insert more than one row at a time," said Don Dysert. "All we're trying to do is create enough room at the top of the spreadsheet for headings, but look at this!" He pointed to the screen as Lynn Baklor manually inserted blank rows one-by-one. Meanwhile, the program recalculated for every insertion, and the team tore off its printout just as the bell sounded, signaling the end of the first problem.

The *Framework* team had enough time to get fancy with its printouts, using the different fonts and type sizes, and it was the first team to finish, 10 minutes earlier than any other. Team member Mike Barry admitted, "We were trying to make it fancy, and we ran into some problems. We didn't make it as flexible as it should have been. But we did get an answer, at least."

Hood and his MicroTrek associates Michael Wilding and Paul Goldner evaluated the printouts using three major criteria: accuracy of the financial answers, speed, and the physical appearance of the printed worksheets.

Framework's team was clearly the winner, not only because it finished early, but also because its printout was judged best on appearance. *PeachCalc*, came in second place with what Hood described as a "decent-looking printout." The *VisiCalc* team took third because it had one minor error, in the analysis section. It was the second team to finish the problem, but the look of the printout was judged poor. The only runner-up to the top three was the *Multiplan* team, with a good-looking spreadsheet that was riddled with errors.

Mike Barry of the *Framework* team attributed his team's win to two things. "Framework was easy to use and helped us crank out the work in such a short period of time," he said. "And this problem was just the kind of thing I used to do as a CPA."

A Sophisticated Model

After lunch, the students returned to the conference room for Ray Hood's explana-

tion of the second problem. This time, each photocopied packet was only two pages long.

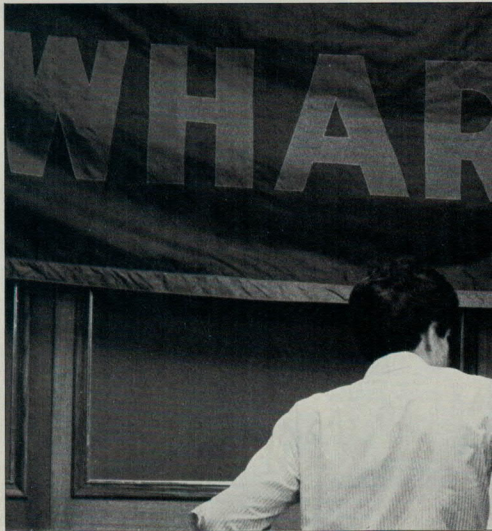
The difference between the first and second problems was like night and day. While the students perceived the first as "all data," they described the second as "all formulas." The teams were given 3 hours to develop a general-purpose model for evaluating a wide variety of lease vs. purchase transactions based on net present value.

While the teams were formulating their strategies for attacking the problem, Hood commented, "These folks are very good. They are doing very well, and I think they will all solve this problem—even the

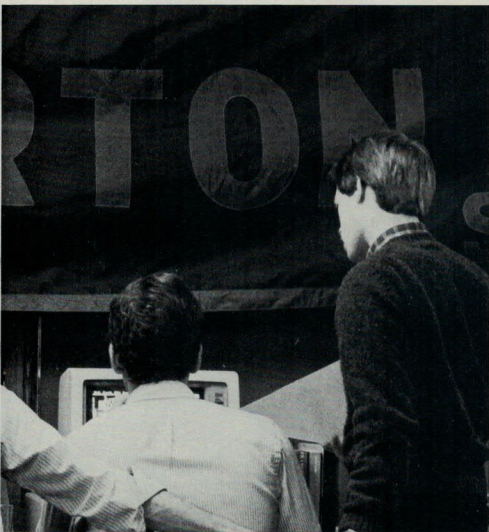
pfs:plan team. They're going to have to overcome a lot of obstacles in their software, but they should be able to do it. *PeachCalc* will struggle, too. This problem was designed to test the more advanced features of the spreadsheets, like the financial functions."

Indeed, neither the *PeachCalc* nor *pfs:plan* team had a payment function. But both teams seemed undaunted by the limitations of their spreadsheet programs. In fact, now that they were familiar with those limitations, they could work more efficiently than they had earlier that morning. It was becoming obvious that given a group of bright minds, even mediocre software would do the job.

The Framework team formulates its strategy for solving Problem 2.



The members of the *VisiCalc* team felt they were doing much better on the second problem, and they were hoping to finish up their work early for the weekend and get to experience some of the diversions that New York City has to offer. "The other problem this morning was all cosmetics," said Jeff Rabetz. "This one is all formulas. It's much better." Added John Goodrich, "Your basic Wharton nerd gets off on a problem like this. It's what we like."



The *Symphony* team also liked the second problem better than the first because, as Craig Corelli said, "it taxes our brains more than it does the spreadsheet, what little brains we have left." But his teammates Bob Blake and Dewey Shay remained confident they would place among the top teams for this problem as they alternated turns at the keyboard. "There's room to move around in this problem," said Blake. "You can get creative and that's what we like to do."

The 1-2-3 team seemed more confused than ever and maintained a fairly constant state of bickering about how to approach things throughout the second problem, as did the team with *The Smart Spreadsheet* program, which had gotten the lease part correct but was way off with the purchase model. The lack of financial knowledge on the part of the 1-2-3 team was showing, despite what the teams members claimed to be reasonable familiarity with the program. For inspiration, the 1-2-3 team pinned up a two-page photograph from the *Sports Illustrated* swimsuit issue but were later heard to admit that "Kathy has not bailed us out of this one."

Late in the second problem, the *Multiplan* team's computer began emitting sounds like an automobile security system gone berserk. Hood investigated. "You've locked your cells," he said. "Yeah, we locked the cells," Adam Gordon confirmed, "but now we want to forget about that and unlock them. We tried to blank over a lot of locked cells." Asked why they got locked in the first place, Gordon responded "This is New York. You don't just leave a spreadsheet lying around unprotected." The team admitted it was having some trouble getting past problems with the software and into the work at hand.

Donna Berry, another flu victim who had sat out the first problem, rejoined the *SuperCalc3* team at about 3 p.m. but didn't stay very long because she was "saving [her] strength for the big problem." Apparently, she was very helpful. She seemed to know a lot about spreadsheets and had spend her 24-hour flu studying the problem and boning up on *SuperCalc3*. All three members of the team had nothing but praise for their software at this point. They needed help and

At 5 p.m. Ray Hood passed out briefcases containing materials for Problem 3. Its size seemed to heighten the general anxiety level.



FACE-OFF



SuperCalc3 was giving it.

Toward the end of Problem 2, the *pfs:plan* team was "ready to go out for drinks," according to Stephanie Simon. "It won't do a declining mortgage payment. This thing is so simple. It's like a cash register." Just then, a light bulb blew out right above their table. "I am in charge of team spirit," said Simon, "and you don't know what that's like until you've played with *pfs:plan*."

Hood had only praise for the handicapped *pfs:plan* team. "They are one of the best. And they know they are operating with one hand tied behind their backs. They're never going to come up with exactly the right answer. But they're plugging away as if they will."

At 3:45, with only 45 minutes left until the end of Problem 2, Rick Goc from the *Enable* team could only say the group was "burnt out." The three had found some bugs in the software, and getting around them became difficult. Still, by 4 p.m. they felt they were almost finished and began preparing to print.

With only 15 minutes left, the *Multi-plan* team was as silent as a group of mourners. Adam Gordon admitted that Problem 2 was a tough one. He said, "There are so many different assumptions you can make here that it becomes very difficult to say if one answer is more right than another."

Hood and his *MicroTrek* associates evaluated the printout results of the second problem using the same criteria as for the first: accuracy, speed, and appearance. Once again, all ten teams completed the task and handed in printouts, though many were pressured to do so at the very last minute.

And once again, the *Framework* worksheet was judged the winner. The team's models were 100 percent correct; it finished nearly half an hour before the next team; and its printout looked very good. The *Symphony* Three came in a close second—their models were as good as those of the *Framework* team, but it took them longer and their printout was of only average quality. The *PeachCalc* team, the second-place winner in the first problem, placed third. Its models were also accurate, but it was the last team to finish. The printout from *PeachCalc*, however, was

judged good, so the *Symphony* team did not beat it by much. The other seven teams weren't even in the running because their models were inaccurate.

The All-Nighter

At 5 p.m. Ray Hood passed out the third problem, and its size seemed to make many of the students feel like passing out. They had been working hard all day, thinking about a New York night on the town, but those visions began to fade as Hood began to speak. What he described was a problem of marathon proportions.

Hood told the students that their boss wanted to acquire Cola World Corporation and that he was willing to pay 20 percent over its book value. The first part of the task was to determine the true value of the company and analyze the potential acquisition. The second part would require the students to present their findings to a board of directors and make a recommendation based on their analyses by 1 p.m. Sunday. "You'll only have 15 minutes to present, so you should summarize your findings on a one-pager," warned Hood. "You're dealing with executives. They get bored after one page. Numbers only. No graphs. No text."

Each team then received a briefcase containing the necessary photocopied financial data on Giant Food and Cola World, as well as on the soft drink market. The students also found a copy of *The New York Times* (presumably to check financial market conditions or the stock price of Coca-Cola, Pepsi, and Dr. Pepper), a pad of paper, and some pencils.

The students regrouped into teams for half an hour or so to study the problem, and a few even began tapping at their keyboards. But by 6:30 p.m. the room was empty. One by one the teams had decided Problem 3 was big enough to warrant a leisurely meal, and for the next several hours the only movement in the room was from ten blinking cursors.

By 9:30 at least one or two members of each team were back to work, most already feeling overwhelmed by the deadline. It was unanimously admitted that students regularly pull "all-nighter" sessions but that this situation was more like the workings of the real business world than what they worked on at school.

The *Framework* team felt confident with the software, but the three were a bit worried by not having taken their finance courses yet. "We're marketing managers," said Mike Barry. "What do we know about acquisitions?" Already, the team didn't think it would recommend purchasing Cola World. Doug Treff had big problems believing that Cola World would get anywhere near the predicted 18 percent market share in 4 years. Asked if it wasn't their job as acquisition people to acquire Cola World, Sam Murphy replied, "It wouldn't be your job for long if you started acquiring bad companies."



The *Multiplan* team was working on various methods of pinning down the true market value of Cola World. Eventually, it settled on three methods. It wanted to calculate the problem using each of the methods and base its conclusions on an average of the three. Adam Gordon hung up the telephone—the scope of the problem forced him to cancel his date for the evening. "I hope the editors realize that this is getting serious," he said.

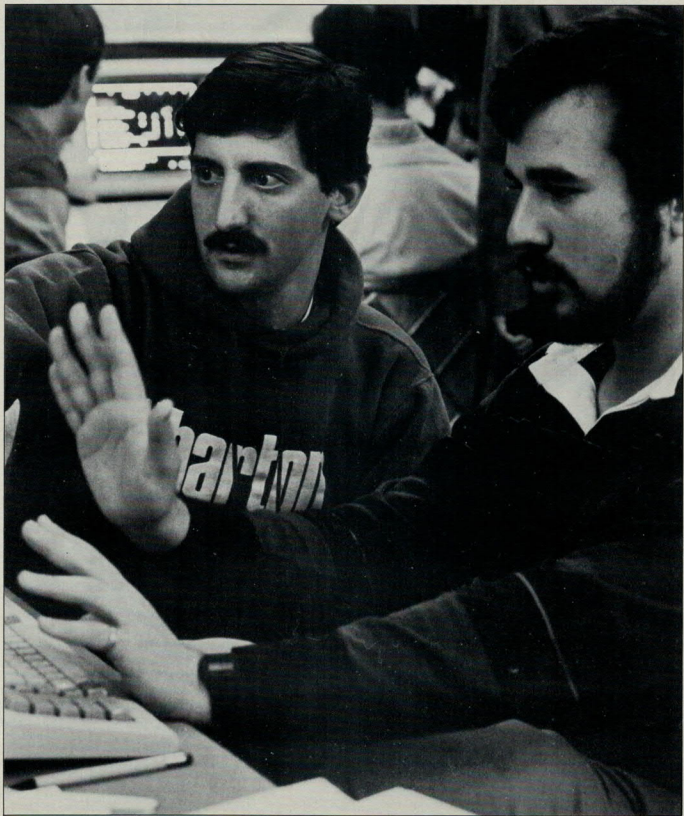
Hood observed, "The thing that has them screwed up now is that they know the franchises are going to lose money, and the temptation is to say you don't want to acquire. But over the last year franchises have done really well. Look at ComputerLand. Five or 10 years ago, who'd have thought it would become a multimillion dollar chain?"

Hood also admitted that he and his partners had been playing around with the numbers the night before and that the balance sheet didn't balance. It was not off by much, but just enough to keep them wondering about the figures. "Nothing ever balances in real life," Hood said. Still, he expected them to come up with a value for the company that was "reasonable, but that is obviously less than what shows from the figures. But it's not that much less. The problem was designed to prove a spreadsheet is a tool, not an infallible magical thing that prevents bad thinking."

At midnight, Andy Pickar sat alone with *SuperCalc3*, sipping Perrier and thinking about the lookup tables he was about to build. Donna Berry was still sick, and his other teammate was having dinner on Long Island and was expected back shortly.

He began typing in numbers for his table. Asked what he thought of the third problem, Pickar said, "I'm not really qualified from a financial standpoint to say. I'm 4 weeks into my first finance course. It certainly seems like a real-world problem. I don't know enough about all this to tell if the numbers are real or not. Cola World has set up its revenue structure in a very precarious way. It is not assured of any future earnings except on sales. It has a 4-year window, but that's about it. After 4 years, there is no base it has been building. It gets franchises to join it, to buy its goods, and after 4 years the franchises

Although the Framework team felt comfortable enough with its progress on Problem 3 to get to sleep by 1 a.m. on Sunday, at 3 a.m. six members of five teams still remained, slogging through the exercise.



FACE-OFF

are on their own and Cola World won't be making anything from them."

By 1 a.m. Sunday morning, the *Framework* team felt comfortable enough with its progress to go and get some sleep, though, as Doug Treff admitted, "This third problem is a bear. If we were doing this in a real business situation with real money at stake, we would never make a presentation based on what we've done here. We'd lose our jobs even if we stayed up all night! But I do think *Framework* has given us a little edge. I'm looking forward to getting the program and I don't even have a personal computer yet. *Framework* is a very

good reason for me to buy a PC."

At 3 a.m., six members of five teams remained, and suddenly, something unprecedented happened, perhaps induced by the fatigue. Most teams had kept to themselves in the true spirit of competition, but now they began openly discussing their basic strategies—not the answers they were coming up with, just the general methods for attacking the problem. No one wanted to complete so much work without some reassurance that they were on the right track. Toward morning, as more students trickled back to work, they too joined these discussions.

Over breakfast Sunday morning, members of the *Symphony*, *VisiCalc*, and *Enable* teams wondered about their work. "In the 6 months of statements we have, the company shows income of \$27 million," said John Goodrich of the *VisiCalc* team. "Where did the losses come from? There must have been a history." *Symphony*'s Dewey Shay commented, "We would get tossed out of the investment bank for presenting this. The analysts wouldn't even look at it. We haven't got enough financial information." His teammate Bob Blake added "It's an interesting problem, but it's certainly not a merger problem. You can't do an evaluation based on 6 months of financial statements."

Asked if it was the group's job to acquire Cola World, *Symphony*'s Corelli responded "It's our job to *evaluate*. After you acquire, you will quickly find out whether or not you screwed up. If you acquire and the company starts losing money, everyone looks at you and says, 'These are your projections, and here are the cash flows. We don't really see the correlation.' Then you no longer have a job."

Back at the *Framework* table, Sam Murphy studied a printout and explained his team's gut feelings. "The first couple of years look bad, and then you get very good profits for a year or two. We don't see any reason to acquire this company, unless we could get it for peanuts. I think our net present value came out to \$10 million. Book value is around \$67 million. So I think we'll pass."

Mike Barry remarked about the third

problem: "I think the problem now is testing the teams more than the software. It's 80 percent experience and 20 percent software. I don't think *Framework* made a difference yesterday, but today it's making things a lot easier for us to output the work."

The Nays Have It

By noon on Sunday, the teams had no choice but to print their results, create a summary sheet, and prepare to defend it in front of Giant Food's board of directors. The board, which would judge this third problem based on both the quality of the answers and the quality of the presentations, was comprised of four distinguished New York business executives: John H. Andren, Jr., vice president of analytical computer services for Manufacturers Hanover Bank; James Kovaks, audit partner in charge of mergers and acquisitions for Price Waterhouse; Gail Harrity, manager of purchasing for the Metropolitan Museum of Art; and Robert Lehmann, vice president of Transway International.

The panel of judges didn't need an explanation of the correct answer from MicroTrek, each having pronounced Cola World as a worthless acquisition within minutes of looking over the financial data the students had been given.

For the judging, a part of the conference room was sectioned off and transformed into a courtroom. Several long tables were linked to form a dais for the judges. Three chairs were placed directly in front of the dais for the students, and in the remaining seats along the sides were PC staff members, various corporate onlookers, and a camera crew that filmed the event. Only the team giving a presentation was allowed in the room; the rest had to pace nervously outside.

The students were barely recognizable when they returned from their rooms after changing out of their casual preppy garb and into regulation corporate dress. With just 15 minutes per team for presentation, the students felt every detail would count.

The majority of the students appeared nervous in front of the judges, but that was to be expected because few had been in this position before. Their assumptions, predictions, and conclusions were picked

On Sunday morning, various team members began to openly discuss their general strategies for solving Problem 3.



at by the panel of heavyweights who played their roles to the hilt. No team got the nice-guy treatment, even those with the best answers. In fact, the more confident or correct a team appeared, the more tenacious the judges became, because part of the test was to see whether the students would stick to their guns.

The students were given a break while the judges conferred. As it turned out, judging the third problem was fairly easy

because only the three winning teams had correctly analyzed the cash flows. The others had failed to discover that Cola World was not worth a premium. In fact, its true value was closer to \$10 million than to the \$55 million book value upon which many teams based the rest of their calculations.

When the smoke cleared, the *Framework* team emerged victorious once again, sweeping the face-off with three straight

wins. The judges credited the team with the best presentation, analysis, supporting information, and the best-looking printout as well. John Andren of Manufacturers Hanover described their win: "The *Framework* group was an impressive team, not only because it prepared a good presentation, but also because it had anticipated questions and had the answers ready. The software also allowed the group time to prepare visuals, which

FACE-OFF



always make a big difference in a presentation. You always look better prepared and better informed with visuals."

The *SuperCalc3* and *Enable* teams, both of which had failed to place in the previous two problems, easily took second and third place. Try as they might, the judges couldn't shake the teams' faith in their answers. The winning teams were doubly pleased with their success because all nine members are in their first year at Wharton and have not yet taken any of the

school's finance courses.

Framework, *SuperCalc3*, and *Enable* had the right numbers and the right answer—don't acquire Cola World—as well as the guts to ignore the judges' attempts to sway them in other directions. Two other teams, *1-2-3* and *VisiCalc*, had arrived at the right answer but allowed the judges to sway them. Both teams were on the right track, despite some errors in their calculations. The *1-2-3* team could not justify an acquisition, yet Mike Crooks was

moved to say his team would "recommend the purchase if there are invisible synergies at work of which we are unaware." Jeff Rabetz of *VisiCalc* called the acquisition "an obscene investment" at one point but backed off by recommending a lower purchase price.

Many other teams devised elaborate schemes with which to justify their recommendation to acquire Cola World. *PeachCalc*'s Greg Fraser proposed the creation of a third corporation called Ugetful

(L. to r.) SuperCalc3 team: Jordan Posner, Andy Pikar, Donna Berry. Judges: James Kovaks, Gail Harrity, John Andren, Robert Lehmann, (seated) Wharton dean Anthony M. Santamero, Bill Machrone. Framework team: Doug Treff, Sam Murphy, Mike Barry.



Corp., which would show owner's equity as 20 percent higher than the existing equity of Cola World. The *Multiplan* team decided to acquire 50.3 percent of the new company, just enough to control Cola World but not enough to risk a big loss for Giant Food. And the *pfs:plan* team wanted to strip the riskier assets of Cola World and sell them to investors, thereby transferring all risk "to the widows and orphans of the world," as Robert Lehmann saw it.

At least one team, *Symphony*, appeared

bitter that the problem had misled them so much. Their familiarity with both finance and computers had led them to believe they would win without an all-out effort. Observers who felt the *Symphony* group should have been among the top three blamed the team's loss on hubris and felt that 1-2-3 would have been among the winners if the product had been given to a team with more experience.

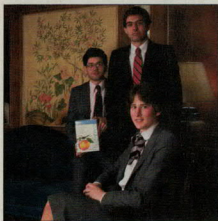
All things considered, the students felt the Spreadsheet Face-off was a good learn-

ing experience, as did the staff of *PC*. Executive editor Mike Edelhart summed it up best: "The role of the software and its effect on the success of the groups was determined by two factors: how much thinking the spreadsheet allowed and the degree of confidence it gave to the teams based on its ease of use, flexibility, and speed. No spreadsheet was so bad that smart minds couldn't overcome it. Likewise, no spreadsheet was so good that it would overcome bad thinking." ■

THE TEAMS

BY PHIL WISWELL

Armed only with leading spreadsheet packages, these ten teams of Wharton business students squared off in an epic shootout.



Left to right: Greg Fraser, Don Dysert and Lynn Baklor of the PeachCalc team.

The PeachCalc Team

The PeachCalc team was composed of three 1-2-3 devotees, Lynn Baklor, Don Dysert, and Greg Fraser, who couldn't find many good things to say about the software. "1-2-3 is much better," said Baklor. "PeachCalc doesn't let you point with the cursor keys, and it's very slow." In fact, speed was the team's biggest obstacle all weekend.

Fraser missed the features he had come to love on 1-2-3 and SuperCalc3. "What's really nice about 1-2-3 is its data tables," he said. "You can vary a parameter, and it will run 20 different scenarios for you.

PeachCalc won't. And it doesn't have lookups. We found we were slowed by trying to change the default drive or trying to read a file from drive B: when the default was the A: drive. You have to go up a couple of levels in the menus to reach the point where you can change the drive and read files from the new drive. And sometimes, when you give it a command you don't really want, it's very hard to back up. There is no simple Escape key."

The list of complaints went on and on. PeachCalc wouldn't copy a row across other rows. The team members couldn't insert more than one row at a time, and PeachCalc recalculated for every insertion. They could not point to cells with the cursor. PeachCalc had no payment function, forcing the team members to spread that formula over a block of cells. And only by experimenting could they prevent their border numbers from being printed.

Complaints aside, the team did rather well, finishing third in Problems 1 and 2. The team failed at Problem 3, but that was owing to human error, not the software.

PeachCalc

Peachtree Software
3445 Peachtree Rd. N.E.
Atlanta, GA 30326
(404) 239-3000
List Price: \$295

Requires: 128K RAM, one disk drive.

CIRCLE 764 ON READER SERVICE CARD



Left to right: Bob Mayo, Rick Goc, and Jack Vresics of the Enable team.

The Enable Team

The Enable team of Rick Goc, Bob Mayo, and Jack Vresics found itself in trouble from the beginning. This was another team of first-year students, untrained financially with the exception of Vresics's accounting experience. And Enable was one of the newest packages included in the event, "so new that a lot of the documentation isn't in the manuals," complained Mayo. "It's on the disks, and the company wants you to print all that stuff out for reference before you even start."

The team's problems began at Wharton. It received the software early in the week and dug right into it, but it took many frustrating hours to get it up and running correctly because neither the manual nor the disks contained proper installation instructions.

The team experienced some software bugs, too. "For one thing," said Goc, "we had a definition that was relative, but when we copied it, it changed to absolute. We had to go into each cell and manually insert the values." Throughout the weekend the team periodically fought what it claimed were inappropriate screen messages about "circular references, among other things."

Yet the team members were impressed with Enable. They cited its incredible speed, flexibility, and ease of use and, for most of Saturday, felt that the documentation was its major obstacle. "We can't get at the problems," said Goc, "because we keep running into problems with the soft-

ware. I hope they clean this up because *Enable* is really a sharp product beneath it all."

Goc agreed to participate in the face-off without really knowing what he'd gotten himself into. "There was this nice little article in the school journal about being in this spreadsheet competition and having a wonderful weekend in New York. It really sounded like a lot of fun. Then, after we get our tickets, we hear about the marathon. I'll be glad I came as long as we place among the top three teams on this last problem. But I'll hate myself if we're number four. That isn't worth it."

Enable

The Software Group
Norway Ten Executive Park
Ballston Lake, NY 12019
(518) 877-8600
List Price: \$695

Requires: 192K RAM, two disk drives, graphics adapter, PC-DOS 2.0 or higher.

CIRCLE 768 ON READER SERVICE CARD



Left to right: Mike Barry, Sam Murphy and Doug Treff of the Framework squad.

The Framework Team

The *Framework* team consisted of three first-year students, Mike Barry, Sam Murphy, and Doug Treff, who decided to enter the Spreadsheet Face-off even though none of them had taken any finance courses. "The three of us formed a study

group for a marketing course last semester," said Treff. "We worked very well together, so we decided to take this on as a team project. It's the competition; we like an intellectual pursuit. Most people at Wharton are like that. I think it's a real challenge to be here, and it probably won't look bad on my resume—especially if we manage to place among the top three teams."

Barry agreed. "Most of the people here have worked for several years, and we like business. That's why we took 2 years out of our lives to study at Wharton. And this event is like a game about business." Barry's teammates were counting on his 4 years of experience as a certified public accountant to help overcome the team's lack of financial knowledge. "He's our computer wiz, too," smiled Murphy. "He's going to carry us through this."

Murphy worked for Arco managing offshore oil exploration ships before coming to Wharton and had some computer experience with IBM mainframes. Both he and Barry own personal computers, as do two-thirds of the students at Wharton, they said. Treff, a psychology major who worked in purchasing and inventory control for Champion International, the largest company in the forest products industry, didn't own a personal computer and had the least experience with electronic spreadsheets. "Am I at that much of a disadvantage?" he asked. Murphy nodded. "By the time we graduate, the computer will probably be a requirement for all students," he said.

Wednesday night was the first time the *Framework* team had been able to find a computer at Wharton with enough memory to run the program. However, in spite of this and *Framework's* unique design, the team members had little trouble grasping the fundamentals by mid-morning on Saturday. Their only problem had been with moving formulas, but that was soon cleared up by the documentation.

"There's a lot to learn," commented Murphy. "It's faster than 1-2-3—there is no question about that—and it's a little bit more flexible. It's easier to combine your worksheets and go back and forth between them. For someone who is going to be using it day in, day out, *Framework* is wonderful. For someone who's just going to

use it now and then, I think it's a bit complex."

Doug Treff commented: "The value of *Framework* is in knowing it well and being able to manipulate it completely."

Framework

Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570

List Price: \$695

Requires: 348K RAM, two disk drives.

CIRCLE 767 ON READER SERVICE CARD



Left to right: Donna Berry, Andy Pickar and Jordan Poener of the SuperCalc3 team.

The SuperCalc3 Team

Andy Pickar and Jordan Poener began the competition without Donna Berry, the third member of the *SuperCalc3* team, who remained upstairs in her room with the flu until late Saturday afternoon, unable to contribute her greater knowledge of electronic spreadsheets. Despite missing one member and being first-year students who had taken no finance courses, Pickar and Poener got off to a fast and confident start, which they attributed entirely to the software.

Pickar and Poener agreed that *SuperCalc3* was very fast and very powerful and were thankful for having had a chance to use it instead of some of the other packages. In fact, both wondered if they would

MAKING A JUDGEMENT CALL

Our board of respected judges brought a wealth of professional experience to their unique role in the spreadsheet face-off.

James P. Kovacs joined Price Waterhouse, New York, in 1968 and was admitted to partnership in 1978. He is currently chairman of the Acquisitions and Mergers department. Kovacs received his M.B.A. from The Wharton School and is a member of the American Institute of Certified Public Accountants and the New York State Society of CPAs.

Seated are, l. to r., Wharton dean Anthony M. Santamero and editor Bill Machrone.

Gail M. Harrity is purchasing manager for the Metropolitan Museum of Art. She has worked as coordinator for a crisis-management consulting group in Mogadishu, Somalia, served 2 years as director of government affairs for the American Society of Travel Agents, and 5 years as legislative assistant to U.S. Senators Richard S. Schweiker and Charles McC. Mathias, Jr. She received her master's in public and private management from Yale.

John H. Andren, Jr., is vice president at the Manufacturers Hanover Trust Company. He has been with the company since 1975 as a credit generalist and loan officer and is now manager of computerized analytical services. Prior to joining Manufacturers Hanover, Andren worked as a loan officer for Franklin National Bank. He did his graduate work in accounting, finance, and computer science at New York University and at Rutgers University.



Robert A. Lehmann began his career at Transway International Corporation nearly 21 years ago by joining a local trucking subsidiary in San Francisco. By 1977, he had moved to the company's headquarters in New York, where until recently he managed Transway's nationwide network of common-carrier freight operations. Lehmann was a U.S. Army officer from 1967 to 1969 and completed the Advanced Management Program at Harvard Business School in 1983.



be allowed to keep the package when the competition was over.

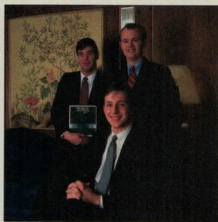
Pickar was elated when his team took third place in Problem 3. He joked about their all-night formula for success: "We took the infinite number of monkeys approach; eventually one of them typed out the works of Shakespeare and another came up with our spreadsheet figures. We threw away the Shakespeare!"

SuperCalc3
Sorcim Corp.
2310 Lundy Ave.
San Jose, CA 95131

List Price: \$395

Requires: 96K RAM, two disk drives or hard disk.

CIRCLE 761 ON READER SERVICE CARD



Left to right: Adam Gordon, Steve Smalling, and Brad Lewis of the Multiplan team.

The Multiplan Team

Multiplan is a popular spreadsheet, but Adam Gordon, Brad Lewis, and Steve Smalling didn't find it too appealing at first. "I'd rather have a programmable calculator," said Gordon. "I use *I-2-3*. It has everything I need, so I wouldn't trade down to *Multiplan*. This may be half the price, but when you're talking about using the product 20 or 30 hours a week, cost becomes insignificant. Also, the formulations are very clumsy compared to Lotus. It's taking us twice as long to do our calcu-

lations as it would have on *I-2-3*."

"But it's only \$125," added Lewis.

The team did not find the software intuitive when seeking cell locations. It also found errors in the documentation. When you send control codes to the printer, the manual says to use a left bracket, but the example uses a right bracket. "We used them both and nothing worked," said Lewis, who later reset the DIP switches inside the printer.

The *Multiplan* team was plagued by an annoying problem with relative and absolute values, as were several of the other teams. "This is terrible!" said Lewis. "We would copy a relative value and it would come up absolute." Eventually, they resorted to doing things cell by cell, wasting time. However, both Lewis and Smalling agreed that *Multiplan* was a good choice for the novice, better than *I-2-3*.

Multiplan

Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
(206) 828-8080

List Price: \$140

Requires: 128K RAM, one disk drive.

CIRCLE 766 ON READER SERVICE CARD



Left to right: The VisiCalc duo of Jeff Rabetz and John Goodrich.

The VisiCalc Team

By Thursday night, the *VisiCalc* team had been narrowed to just two first-year students, John Goodrich and Jeff Ra-

FACE-OFF

betz. The team's third member had fallen prey to the flu and was forced to withdraw from the competition. However, both of the team's remaining members had been employed prior to entering business school and had obtained significant experience with 1-2-3. In comparison with other spreadsheets, they found *VisiCalc* to be slightly obsolescent, lacking many of the built-in functions that are taken for granted in most of the newer programs.

"It's not quite 1-2-3," said Goodrich, whose background is in commercial banking. "In order to copy columns you have to keep hitting the Relative key. It continuously gives you a choice of relative or absolute values, which is nice, except when you don't want to bother. It would be nice to have a default. That slowed us down."

Still, the *VisiCalc* team had little trouble getting off to a fast start on Problem 1 and didn't come up with many other complaints. "It's an Edsel running in a fast crowd," said Rabetz. "It's not badly designed; it just lacks a lot of newer features. We'll do pretty well with it."

VisiCalc did do pretty well, but not as well as might have been expected. The best the team was able to do was place third in Problem 1. In response to his team's poor showing Goodrich directed much of the blame toward the product: "Given a little better software, we could have focused on the problems faster and come up with a little better presentation. We had a very difficult time printing. We couldn't set up titles, and so we had to go out of *VisiCalc* to get a compressed type to fit our presentation on one page."

Goodrich was glad he came, even though he had to work with *VisiCalc* rather than one of the newer packages. "I've learned a lot about spreadsheets. *Frame-work* looked pretty good. They all did compared to the Edsel here, except maybe *PeachCalc* and *pfs:plan*."

VisiCalc

Software Arts, Inc.
27 Mica Lane
Wellesley, MA 02181
(617) 237-4000

List Price: \$179

Requires: 192K RAM, one disk drive.

CIRCLE 759 ON READER SERVICE CARD



The lineup for Symphony, left to right: Craig Corelli, Dewey Shay, and Bob Blake.

The Symphony Team

The *Symphony* team members—Bob Blake, Craig Corelli, and Dewey Shay—had more going for them than just the popular integrated package from Lotus. All were in their last year at Wharton, possessed solid financial backgrounds, and were experienced users of personal computers and spreadsheet software. Blake, whose major field is investment banking, uses 1-2-3 on his own IBM PC. Shay was also familiar with 1-2-3 from his experience as an investment banker.

However, the team experienced several problems, few of which they blamed on the software. Indeed, many other teams preferred *Symphony* over the other packages. Corelli pored over the manual during most of Problem 2 without locating the information he wanted on vertical lookups, but otherwise he reported no problems with the software.

All three members of the *Symphony* team are currently interviewing for jobs. Asked why they had come, Corelli said, "I thought it would be interesting. I think it would have been more interesting if they'd let us cheat by talking to other groups so we could get a feel for the different spreadsheets. If we could have been involved in five different spreadsheets, we could have seen the difference. We're sort of stuck here crunching numbers. But it's more real-world than school because we have to make assumptions and then find a way to

justify them. It's pretty challenging."

Blake had a different response. "I don't know what I'm doing here," he said. "I signed up on Monday and convinced these guys to come too, but by Tuesday I was sorry. I've got a lot going on right now. I've got lots of projects due. I should be at Wharton now sending out resumes."

Symphony

Lotus Development Corp.
161 First St.
Cambridge, MA 02142
(617) 492-7171

List Price: \$695

Requires: 320K RAM, two disk drives or one drive and a hard disk.

CIRCLE 760 ON READER SERVICE CARD



The Smart team, left to right: Robert Benson, Dave Boch, and Dennis Bloch.

The Smart Spreadsheet Team

Robert Benson, Dennis Bloch, and Dave Boch had little success with *The Smart Spreadsheet* all weekend. Benson, who has been using Lotus's 1-2-3 at school for a year and who is also familiar with *Symphony*, felt more comfortable with the software than his teammates did and spent much of his time "trying to bring my partners up to speed." Benson had started working with *Smart* a few days before the competition, but his teammates didn't have the opportunity to do so.

Bloch and Boch, who were less sure of

what they were doing, blamed the software. Slow recalculation times were their biggest complaint. They also found errors in the documentation, which lessened their interest in *The Smart Spreadsheet*. In fact, even its name began to grate on their nerves.

Benson admitted that *Smart* took getting used to. "When I am anchoring something, I keep hitting that period and can't break the habit from 1-2-3." Still, the team agreed that the spreadsheet had a lot of potential power. "If I didn't have a spreadsheet and were starting from scratch," said Benson, "I'd buy *Smart* because I know there is all this other software in the product line that will grow with me."

The Smart Spreadsheet

Innovative Software, Inc.

9300 W. 110th St.

Overland Park, KS 66210

(800) GET-SMAR(T)

(913) 383-1089

List Price: \$495

Requires: 256K RAM, two double-sided floppy drives or hard disk, PC-DOS 2.0 or higher.

CIRCLE 762 ON READER SERVICE CARD



Left to right: pfs:plan-ers Stephanie Simon, Dave Frick, and Lynly Beard.

The pfs:plan Team

Lynly Beard, Dave Fricke, and Stephanie Simon felt less than lucky to have been assigned *pfs:plan*, the least powerful spreadsheet of the ten in the face-off. In

Fricke's words, "Problem number one was fundamental: this spreadsheet doesn't have cell referencing. When you refer to a cell in a formula, it is by row and column names. Our heading sizes are limited to a mere 25 characters. Period. It goes smaller, but no larger, and that got in the way a couple of times."

Everyone felt sorry for the *pfs:plan* team, but as several observers pointed out, the team members never showed signs of giving up. When their spreadsheet lacked a formula function, they constructed one out of large blocks of cells. They also ran into problems with printing, which eventually caused them to cut and paste pages together by hand. Simon admitted that the software was easy to learn, but not applicable to the types of complex business problems at hand.

One observer called *pfs:plan* a better-menu planner than a spreadsheet, eliciting laughter all around. "It really is a weakling," said Beard, "so we'll have to overcome its lack of brains by applying substantial muscle."

"For \$140, it's great," explained Fricke. "It recalculates quickly at first, but once you get a fairly good-size spreadsheet, it seems to wait for a while, and you are locked out. Speed of entry has been a problem. We would enter a formula, a title, a number, anything, with the Recalculation function off, and it would just sit there for 10 seconds as if it were recalculating, but it wasn't."

Despite the fact that the *pfs:plan* team was in for a harder struggle on the third problem than any other team, its members decided to buck conventional wisdom and not to stay up all night as so many others did. They figured their best chance for success lay in their creativity and financial knowhow, so all three retired quite early Saturday evening for a session of brainstorming and a good night's sleep.

pfs:plan

Software Publishing Corp.

1901 Landings Dr.

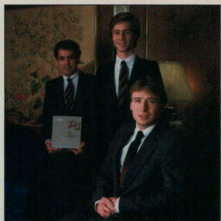
Mountain View, CA 94943

(415) 962-8910

List Price: \$140

Requires: 128K RAM, one disk drive.

CIRCLE 763 ON READER SERVICE CARD



The men from 1-2-3, left to right: Adlai Wertman, Walter White, and Mike Crooks.

The 1-2-3 Team

The team assigned to Lotus's popular 1-2-3 had the least computer and finance experience of any team in the event. Mike Crooks, Adlai Wertman, and Walter White were all in their first year at Wharton. Not far into Problem 1, it became apparent that the team had no solid experience with any electronic spreadsheet.

Wertman couldn't really explain why he and his fellow 1-2-3 team members volunteered to enter the competition. "I don't know what we're doing here," he said. "I know it's going to be an uphill battle. I guess if we can manage to learn 1-2-3, we'll have gotten something out of it."

Although the team members struggled all weekend without overcoming their handicaps, none of the members would blame the software. "No, 1-2-3 is great," they responded in unison. "It's fast," said Crooks, "and it has all the functions we might need. I think it's the only thing keeping us from giving up right now. I mean, we were told this was going to be a fun weekend in New York!" ■

1-2-3, Version 1A

Lotus Development Corp.

161 First St.

Cambridge, MA 02142

(617) 492-7171

List Price: \$495

Requires: 123K RAM, two disk drives, color/graphics card.

CIRCLE 765 ON READER SERVICE CARD

WHAT THEY DON'T TEACH YOU AT THE WHARTON SCHOOL

BY RAY HOOD AND MICHAEL WILDING



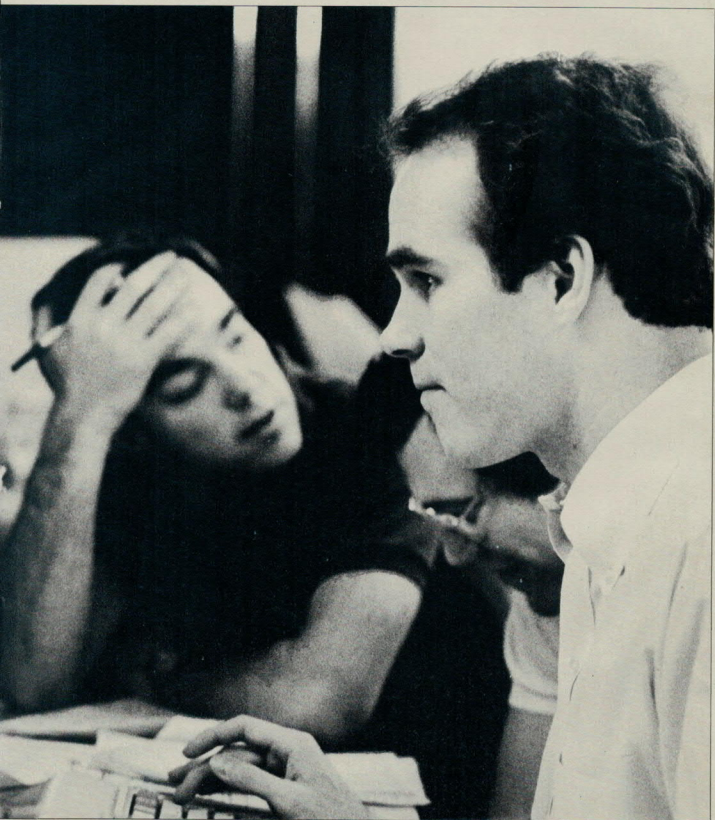
Which is the best spreadsheet? Hundreds of benchmark comparisons have attempted to answer this question, but benchmark tests offer few clues as to how a program performs in actual use.

The Spreadsheet Face-off was an effort to add some excitement and realism to software comparisons. Take 29 M.B.A. students, ten spreadsheet programs, and 2 days of high-pressure work, as we did, and you're bound to come up with some interesting results.

The exercises yielded valuable information about spreadsheet software and business applications software in general. What was learned can help users separate the facts from the hype that permeates the industry.

(continued)





Photograph: Robert Phillips

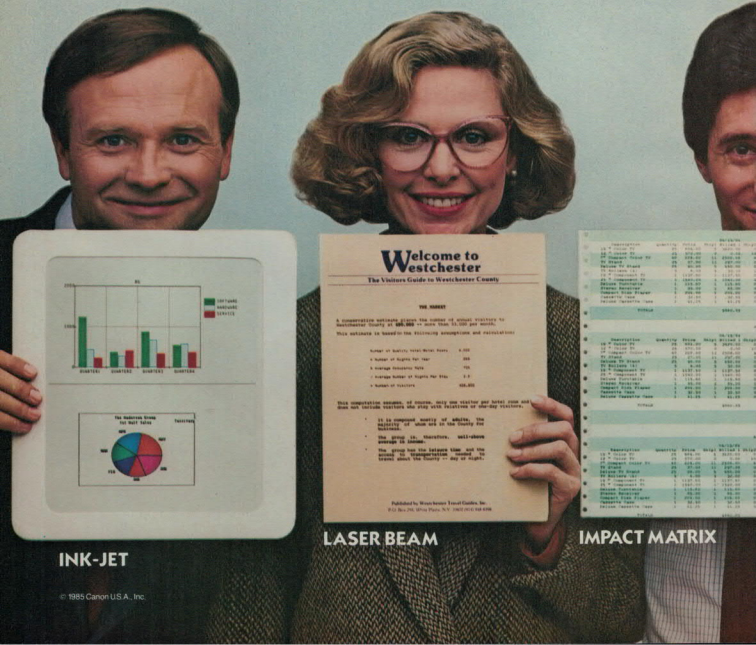
PRINTOUTS TH

Take a close look at Canon's line of printers. The first thing you'll notice is how good they make you look. That's because Canon's experience in high-tech optics really shows. For instance, Canon was among the first to make a desktop Laser Beam Printer. At a price that's within any business's reach, the Canon Laser Printer can produce eight pages a minute with a quality that's more in common with a professional print shop than a personal computer.

Canon also developed the ingenious Bubble-Jet Printer technology, finally making it possible for a printer to not only work extremely quickly but also incredibly quietly.

Our Ink-Jet Printer can produce exceptionally sharp, high-resolution graphics in seven colors, even on transparencies. While the Thermal Transfer Printer has three kinds of print modes, including letter quality, at a very competitive price.

And the Canon Impact Matrix Series, for regular and extra-wide column paper, makes printing very fast, very economical.



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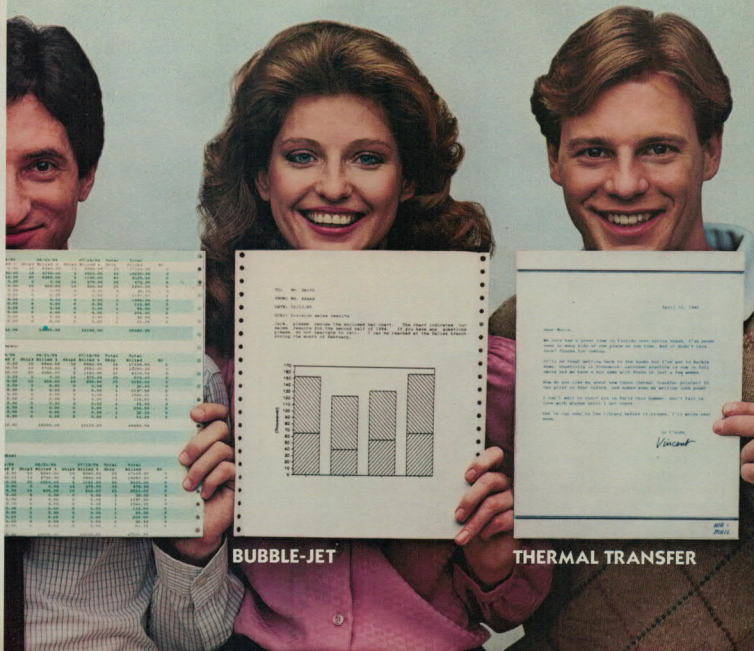
For more information, call 1-800-323-1717, ext. 300 (in Illinois, 1-800-942-8881, ext. 300). Or write Canon U.S.A., Inc., Printer Division, P.O. Box CN 11250, Trenton, NJ 08650.

Canon[®]

PRINTERS



CIRCLE 216 ON READER SERVICE CARD



FACE-OFF

Test Objectives

The results of the face-off indicate that there is no one best spreadsheet. Surprised? We weren't. As the designers of face-off problems, we knew that there would be no clear winner. The free-form nature of the event made it impossible to draw fine distinctions among the programs.

However, there was also a hidden objective in developing the problems. We suspected that the event would illustrate that the key to software performance and productivity is really the user's own skills and judgment, rather than any special features of the software itself. Many spreadsheet programs on the market can handle the vast majority of applications quite well, but only if the user knows how to handle the spreadsheet.

The Participants

MicroTrek's role in the Spreadsheet Face-off included designing all the problems, assisting the teams during the event, judging the results of Problem 1 and Problem 2, and coaching the judges of Problem 3. As representatives of MicroTrek, a corporate training and consulting organization, we have a unique vantage point from which to evaluate the results.

The ten spreadsheets were chosen from among today's most popular software and included the spreadsheet components of several integrated packages.

Our test subjects were 29 M.B.A. candidates from The Wharton School of the University of Pennsylvania. Most of the students are majoring in finance or accounting. They were the ideal subjects for this testing, given their strong analytical skills and business backgrounds.

The students were divided into ten teams. One week prior to the contest, each team was assigned a spreadsheet program based on its members' experience with PCs and spreadsheet software. No team was given a package of which its members had more than a cursory knowledge. Most of the students spent very little time working with the software in preparation for the exercises.

The teams were instructed to solve three business problems over a 2-day period. The exercises grew progressively more difficult in terms of both program

skill and business knowledge.

With only three problems and a small sample group, the results would depend primarily on the skill and ingenuity of the teams, not on the software. However, we were less interested in determining "winners" than in analyzing how human skills, nature, and judgment affect the use of any program.

Financial Projections

Problem 1 required the teams to construct a general-purpose financial statement analysis model (see Figure 1). The



students were given a copy of a manually prepared schedule currently used by a large multinational bank to evaluate credit risks. They were told to recreate the schedule with their spreadsheet programs and then analyze the statements of Giant Food, a large food distributor. The time limit was 90 minutes.

The purpose of this problem was to see how the students and the programs would handle a large but relatively simple problem. The programs' more sophisticated features were not used—only basic commands were needed to complete the problem. The key challenge was how well and how quickly the students would learn and adapt to the program's interface. The faster they adapted, the faster they would complete the problem. Of course, the pitfall of speedy completion was the risk of inaccuracy.

The printouts of each team's model were evaluated on the basis of three criteria: accuracy of analysis, speed of completion, and appearance. Judging was relatively easy because the time pressure

apparently caused many teams to construct incorrect formulas in the analysis section of the problem.

The top three teams—*Framework*, *PeachCalc*, and *VisiCalc*—were the only ones that correctly calculated all the financial ratios, working capital, and cash flow. Teams with incorrect answers were eliminated regardless of how quickly they finished or how good their final product looked.

Lease vs. Buy

Problem 2 required the teams to con-

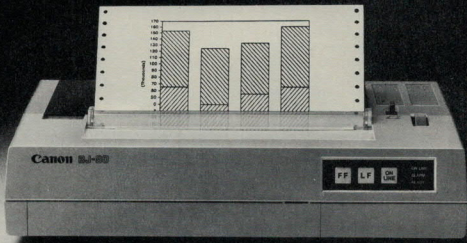
We suspected that the event would illustrate that the key to a spreadsheet's performance is the user's skills and judgment, rather than special features of the software itself.

struct a sophisticated model for analyzing lease vs. purchase decisions (see Figure 2). The teams were instructed to include all tax considerations in the model with the exception of the Investment Tax Credit (ITC). The exercise was designed to test the more advanced features of the programs, especially the financial functions. The level of difficulty in this problem was quite high, and the teams were given 3 hours to complete it.

This exercise required less keyboard action and more reflection and research by the team members than Problem 1 did. It tested their ability to master advanced formulas as well as the programs' documentation of those formulas. All the teams wrote formulas involving advanced financial, logical, Boolean, and, in some cases, table functions.

The printouts of the models were evaluated based on the same criteria as in Problem 1. All of the teams (except *pfs:plan*) completed the problem within the allotted time. Again, time pressure was a significant factor.

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FACE-OFF

Framework again placed first, followed by *Symphony* and *PeachCalc*. None of the answers calculated by the other teams was completely accurate.

Complex Acquisitions

The third and final problem (Figure 3) was open-ended, involving the proposed acquisition of Cola World, a high-flying start-up cola franchiser, by Giant Food—the company the participants had created a financial analysis model for in Problem 1. The teams were told to value the target company, structure the acquisition in the most advantageous way, and support their conclusions in front of the board of directors. Cola World's financial condition and market outlook were based on those of a real company that has since entered bankruptcy proceedings. The teams received the problem at about 4:30 p.m. Saturday, and they had to come up with an answer before 1 p.m. Sunday.

The purpose of Problem 3 was to see how well the students could use the software as an accessory to their decision and thought processes. The exercise was also a test of human nature—the teams were told that their boss thought the target was worth a premium and that he was intent on making the acquisition. Actually, the target company was worth little, if anything. In addition to arriving at the correct conclusion, the teams had to have the courage to stick to their recommendations in front of the panel of judges.

As expected, many teams immediately became bogged down in number crunching and failed to reflect on the problem at hand—a common problem among spreadsheet users. The power of the program made them think that they could answer any question through brute-force computation.

The judges listened to presentations from the ten teams and chose the top three. Once again, the *Framework* team placed first, this time followed by *SuperCalc3* and *Enable*. The *VisiCalc* and *Symphony* teams were the runners-up, but they had errors in their analysis of the cash flows.

Many of the teams came up with rather novel financing ideas. However, most failed to address the unstated but critical question: Should the company make the

Problem 1—Financial Projections

You are a fast-rising young analyst at a major U.S. investment-banking firm. It has recently come to your supervisor's attention that you are a black belt in spreadsheet design. She wants to improve analyst productivity by having you create a general-purpose model for analyzing historical and creating pro-forma financial statements.

The manual form that is currently used to perform analysis is attached. Create a *general-purpose* model in the same or a very similar format.

Your first test of the model will be the financial statements of Giant Food, Inc. Your supervisor wants an analysis of the 1984 results and an income statement projection for the next 3 years, using the following assumptions:

1. Sales growth is 10 percent the first year and 9 percent for the next 2 years.
2. Cost of goods sold are a fixed percentage of sales (73 percent).
3. Interest is 11 percent of borrowings (borrowings remain constant from 1984 onward).
4. Effective tax rate is 44 percent.

Your supervisor also wants to be able to use the model to change the assumptions if necessary. She has no spreadsheet experience.

You have 1½ hours to complete the problem.

Figure 1: This is Problem 1, just as it was given to the 29 test participants. It tested the students' adaptability to their spreadsheet programs.

Problem 2—Lease vs. Buy

Your financial statement analysis model was such a success that your supervisor was promoted, and you got a pat on the back. So you quit the investment bank and are now working for a financial consulting firm.

Your first project is to develop a lease vs. buy model that your firm plans to market to its clients. The model should be capable of analyzing a large variety of potential acquisitions. The decision on whether to lease or buy should be based on the net present value of the relative cash flows with ACRS and depreciation factors taken into account.

Your predecessor tried and failed to come up with a successful model. He left some materials (attached) that you may find useful.

The model should be usable by someone with little spreadsheet experience.

You have 3 hours to complete this problem.

Figure 2: Problem 2, a lease vs. buy exercise, required the test participants to use the advanced financial features of their programs.

Problem 3—A Complex Acquisition

You are employed as an analyst in the mergers and acquisitions unit of Giant Food, a highly successful food-pharmacy retailer with over 100 stores across North America. Giant is on the hunt for juicy takeover targets. Your boss, I.B. Risqueaker, has identified Cola World Corporation as his next victim.

Cola World is in the business of granting licenses to third parties to manufacture and distribute its premium software beverages. I.B. thinks that its business fits nicely into Giant's strategic plan, and he is quite intent on making the acquisition.

I.B. has assigned you to analyze the Cola World acquisition and make the appropriate recommendations. The project can be broken down into the following tasks:

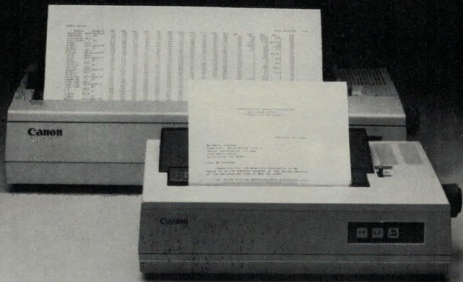
1. Determining the probable acquisition price:

(continues)

Figure 3: Problem 3 involved a complex acquisition plan that tested how well the students had incorporated their program's features into their individual problem-solving processes.

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FACE-OFF

acquisition at all? Most of the teams that considered this question found that the answer was no.

Many of the teams sidestepped the valuation question to get to the more glamorous job of financing the acquisition—as we expected they would. They accepted the idea that the company was worth a premium without even questioning its true value.

The teams that performed the best did a detailed market analysis based on the consultant's projections. They then derived the probable cash flows under these assumptions and performed a discounted cash flow analysis. The winning teams went one step further and stated that they felt the consultant's assumptions about Cola World were over-optimistic.

Drawing Conclusions

Based on the results of three problems, it would appear that *Framework* has the best spreadsheet, but this is not a valid conclusion. What's clear is that the *Framework* team did the best job with its spreadsheet. Its members approached the problems in an organized, unhurried fashion and completed every problem well within the time limit. Their analysis of the acquisition in Problem 3 was strikingly similar to our own.

Some valuable lessons emerged from the participants' and programs' performances. First, a package generally considered to have an extremely weak spreadsheet, *Framework*, placed first in every exercise. (Figure 4 shows the *Framework* team's answer to Problem 2.) *Framework*'s small spreadsheet (4,000–5,000 cells), in outline form, appears to be a very effective tool for organizing a problem and breaking it down into its various components. In contrast to *Framework*'s spreadsheet, Lotus's 1-2-3 contains 500,000 cells, *Symphony* has 2 million, and *The Smart Spreadsheet* has 10 million. Are we being sold huge spreadsheets that are too difficult to organize?

Nine of the ten products tested (all but *pfs:plan*) proved to be quite capable of completing each of the three problems. The second-place finish of *PeachCalc* and the third-place finish of the venerable *VisiCalc* in Problem 1 indicates that good products are not only available now but

(Figure 3, continued)

I.B. believes that Giant will have to pay a substantial premium over book value (at least 20 percent). You are to analyze the financial statements of Cola World and use the data supplied about the beverage market to project Cola World's future performance and determine the premium.

2. Structuring the transaction:

After you determine what Giant should pay for Cola World, I.B. wants you to figure out how to finance the deal. He's given you complete freedom in determining the instrument(s): debt, equity, or some combination of the two. Giant has borrowed in foreign capital markets and is not adverse to doing so again. I.B. is fond of arcane financing techniques but is concerned with keeping a nice-looking GAAP financial statement.

3. Supporting your conclusions:

You must support your decisions with detailed financial analysis. Schedules should be developed detailing your determination of purchase price, and pro-forma financials should be developed for the combined companies.

4. Presentation:

You must analyze this deal quickly and efficiently. You will go before the board of directors tomorrow at 1 p.m. to give a presentation. You should prepare a summary report for the board members to review. Detailed supporting schedules may be necessary. The board is composed of financial heavyweights. They want hard numbers; graphs are for wimps. The board is extremely busy so your presentation is limited to 15 minutes.

LEASE ANALYSIS

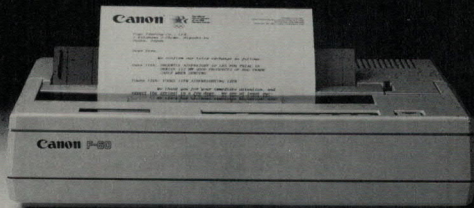
A. ENTER THE PERIODIC LEASE PAYMENT	\$35,000.00
B. ENTER THE NUMBER OF PERIODS	6
C. ENTER THE PERIODIC DISCOUNT RATE (EXAMPLE, ENTER 10% AS .10)	15.00%
D. ENTER THE EFFECTIVE TAX RATE	50.00%
NET PRESENT VALUE	(\$76,162.71)

PURCHASE ANALYSIS

A. ENTER THE PURCHASE PRICE	\$250,000.00
B. ENTER THE DOWN PAYMENT PERCENTAGE	20.00%
C. ENTER THE LOAN INTEREST	12.00%
D. ENTER THE LOAN TERM--PERIODS	7
E. ENTER THE EFFECTIVE TAX RATE	50.00%
F. ENTER THE ACRS CATEGORY	2
ENTER 1 FOR 3YR ACRS	
ENTER 2 FOR 5YR ACRS	
ENTER 3 FOR 10YR ACRS	
G. ENTER THE PERIODIC DISCOUNT RATE	15.00%
H. ENTER THE SALVAGE VALUE	\$52,500.00
I. ENTER THE EXPECTED LIFE--YEARS SOLD	8
NET PRESENT VALUE	(\$85,030.57)

Figure 4: The first-place *Framework* team devised this model as an answer to Problem 2.

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Extreme flexibility gives access to three attractive printing modes. Printing speeds range from Draft at a rapid 80 cps, through Near-Letter-Quality to Letter-Quality at a smooth 20 cps and an impressive high-resolution 36x24 dot matrix.

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THE HUMAN FACTOR

By throwing undue emphasis on ultrafeatures and extras, software companies have souped up their spreadsheets, but they've neglected the user.

The Spreadsheet Face-off offers some useful lessons for all those involved in the software industry—users as well as vendors. The most important lesson is that it's time to focus on the key ingredient for the productive use of any program: the skills and abilities of the user.

The media, as well as software-seeking organizations, pay too much attention to feature-by-feature comparisons, as though the sum total of a program's features is an indication of the program's usefulness. So many capable programs are on the market that the microcomputer spreadsheet has practically become a generic product. Each has a unique set of "extras," but these specialized capabilities are irrelevant to the vast majority of spreadsheet users.

Not enough attention is placed on teaching PC users how to integrate this powerful software into their own analytic and decision-making processes. This is not a natural step for most people; they either get caught up in the mechanics of using the program (as did many of the students when they tried to solve Problem 3), or else they ignore the computer completely.

Reliance on the Machine

Although many organizations are now addressing the issue of providing users with rudimentary PC skills, the larger issue of how to promote effective use of spreadsheet tools has been side-stepped. It is not enough to teach users to create formulas, insert rows, and print reports. They must also understand what PCs should and should not be used for. Too often, PC users are trained to use the machine as a tool for generating massive quantities of information, as though printing out large amounts of data were the end rather than the means to a good

decision. More information is not necessarily better—the quality of a decision does not rest on the quantity of the data analyzed.

Organizations must now begin the arduous task of training users to create applications with their software, not just printouts. Users must also be made aware of the potential pitfalls of over-reliance on software when making a decision. Training must focus on using the software to derive significant information. This kind of training does not emphasize the features of the particular software—rather, it emphasizes how PC applications can be developed to enhance an organization's information flow and decision-making processes.

The Spreadsheet Face-off can also teach some lessons to those software manufacturers wondering which state-of-the-art superfeature to include in the next release. Instead, software companies would do better to consider how to assist their users in making effective use of the basic features that their software already has.

Addressing the Real Problem

Many vendors are currently addressing this problem by beefing up user hotlines, establishing authorized training centers, improving program documentation, encouraging publication of books and other educational tools, and promoting third-party development of business applications. However, this ad hoc approach will not work; software manufacturers must begin to develop long-term strategies for promoting the effective use of their software. Of course, it would also help if leaders in the software marketplace became less concerned with the latest technology and focused instead on the effective use of existing programs.—R.H. and M.W.

have been available for a long time.

1-2-3 was not among the top three in solving any of the problems. Is this an indication that its reputation is undeserved? We think not. 1-2-3 was deliberately assigned to the team with the least prior PC experience, and, despite its technological disadvantage, the team managed to perform well. The team members thought the program was great.

Problem 2 was as complicated a question as most people ever attempt with their spreadsheets. The fact that nine out of the ten programs were capable of completing the problem indicates that there is not a great difference in the capabilities of most spreadsheets. The super-advanced features that vendors trumpet may not be relevant to most users. The third-place finish of *PeachCalc*, a program with few advanced features, is a case in point.

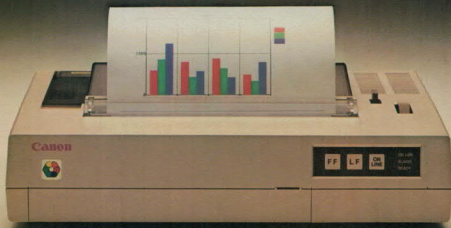
Much has been said and written about the difficulty of using many spreadsheets. However, the students did not appear to have trouble learning their programs. In a matter of hours, they grasped many of the advanced functions and commands of a completely new piece of software. *Symphony*, for instance, a product that has been criticized by many reviewers for being difficult to use, placed second in Problem 2. Since the team had no previous experience with the package, it appears that *Symphony's* spreadsheet, at least, isn't so difficult to master.

Paralysis of Analysis

During Problem 3, many students stayed up all night at the keyboard when a few hours would have sufficed. This phenomenon is the "paralysis of analysis" to which many spreadsheet fanatics seem prone. A spreadsheet program is often the first—and sometimes the only—software that PC users learn. They become prejudiced by that experience and come to believe that any problem can be solved with a spreadsheet. Above all, the Spreadsheet Face-off demonstrated that no software program is a substitute for clear, logical thinking. ■

Ray Hood and Michael Wilding are officers of MicroTrek Enterprises, Inc., a consulting and training firm in New York.

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Except when you first buy it, take out the five floppy disks, study the manual to figure out which ones do what, put the plastic doohickey over the keyboard, and begin reading about all the installation procedures you need to get the thing up and running.

Or if you never make a circular calculation (any simultaneous equation, even something as simple as "bonus equals 10% of profit after bonus") when doing a complicated spreadsheet.

By the time 1-2-3 calculates it correctly, you may have retired.

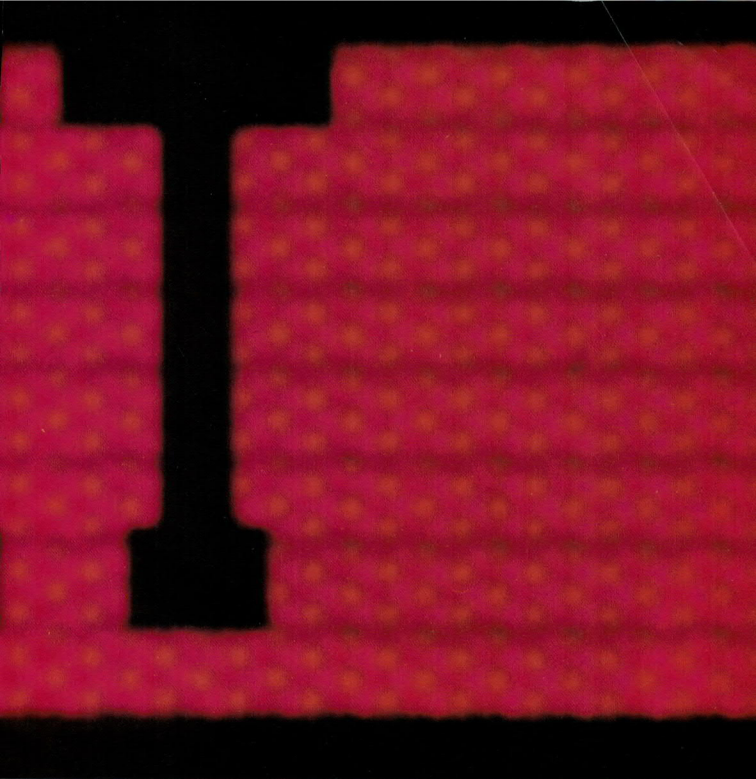
Or if you'd like to plot your data with a single keystroke, because it can take several minutes (including a disk change) just to start the process.

Or if you'd like to quickly create a file directory under program control. 1-2-3 can't do that at all.

What's the point of all this?

We'd like you to go down to





your software dealer and see a new product called SuperCalc® 3 Release 2, which, unlike Lotus 1-2-3, does all of the above.

Along with a larger spreadsheet. Vastly superior graphics. Incredible speed (that becomes even faster when used with the 8087 or 80287 math co-processors, which 1-2-3 doesn't support). And more.

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All on one disk that you can run right out of the box. (Our lawyers want you to know we include an addi-

tional file disk. Which also contains the popular printing program Sideways™, so you'll never have to cut and paste wide printed reports together again. Unless you use 1-2-3.)

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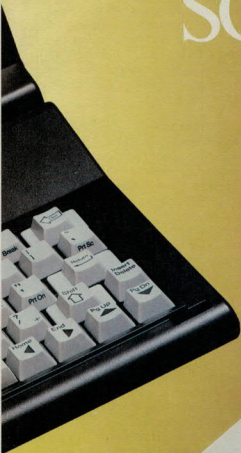
PIVOT PASSES THE SCREEN TEST

Morrow's new MS-DOS portable goes beyond PC compatibility with its superior LCD display.

Morrow Designs Inc. has been around for about 10 years—virtually an eternity in the micro-computer world—for good reason. It has concentrated on making quality products at a reasonable price. While the company has built its reputation on low-cost 8-bit systems with lots of bundled software, it has now moved into both the 16-bit and the portable worlds with its Pivot computer.

The portable computer market offers an overabundance of choice. Prices range from practically throwaway to ridiculously expensive; features range from spartan to lavish. While most portables offer a varying amount of utility depending on their raison d'être, all but those with expensive and power-hungry electroluminescent displays have LCD screens that fall some-

Photograph: Les Mervin



THE PIVOT PORTABLE

where between "acceptable" and "not worth the effort."

Into this marketing mix comes the Morrow Pivot, a machine that, while familiar in some respects, differs markedly from other portables.

The basic package, a battery-operated MS-DOS portable that runs many IBM PC programs, is undoubtedly familiar. But several nice touches differentiate the Pivot from the rest of the lap-top crowd. Of these, the Pivot's main attraction is its screen. It is, quite simply, the best LCD display I have ever seen. If you bought one of those unfortunate portables with an LCD display that leaves you wondering where your data is, Morrow's Pivot might well restore your faith in LCDs.

The Basic Black Box

George Morrow must have admired Henry Ford, because there is a little bit of the Model T living on the inside of the Morrow Pivot. You can buy a Pivot in any color you want as long as it's black, and in any configuration as long as it has either one or two floppies and either 256K or 640K RAM. The package includes a 12-volt nicad battery and an AC adapter, which automatically recharges the battery. The black color is a refreshing change from the world of cream-and-beige plastic, but the lack of a long (and expensive) line of peripherals and add-ons is truly a move against the tide.

For your relatively modest investment (\$1,995 list for the 256K model; \$2,795 for the 640K model), you get to carry home a black box that weighs 13 pounds and measures 13 inches wide by 5.6 inches deep by 9.5 inches high. An IBM-compatible parallel printer port and an RS-232C serial port are standard, along with an

RJ11 telephone jack to connect the internal 300-baud modem to the telephone line. A shoulder strap for carrying the Pivot completes the package.

Inside the black plastic case are 32K bytes of ROM that contain programs for a calculator, an appointment calendar, and a personal phone directory. Data for the phone and appointment list programs resides in 4K of nonvolatile RAM. The CPU for both models is a low-power CMOS 80C86 microprocessor, running at 3.33 MHz. The floppy disk drives are 5 1/4-inch

A blue-black glow behind the Pivot's LCD display makes the characters sharp and crisp in any light. In fact, you could even use the Pivot in total darkness with no loss of screen legibility.

IBM format, storing 360K each, and the 640K version of the Pivot also supports a RAMdisk. Morrow claims that the Pivot is the only battery-operated portable with 5 1/4-inch PC-standard disk drives.

The Pivot comes with a slightly customized version of MS-DOS 2.11 and is bundled with *NewWord*, which is essentially a *WordStar* clone.

Great Screen

The Pivot screen is unique on a number of counts. The most impressive, without question, is the backlit display. If you've used a portable with an LCD before, you know that direct light on the screen is necessary before you can see anything, and even then you might have trouble. Trying to use a standard LCD display under marginal lighting conditions is about as fruitful as using your PC without a monitor—or maybe less. At least if you take away your PC's monitor, you know it's not there. With an LCD you still have a screen—you just can't see anything on it.

I'm not sure how Morrow has done it, but the results are remarkable. The company claims it has added "specialized lighting and contrast enhancements to existing

display technologies." The result, a blue-black glow behind the Pivot's LCD display, makes the characters sharp and crisp in any light. In fact, they are sharp and crisp even without light: You could actually use the Pivot in total darkness without loss of screen legibility. The resolution is still not up to the quality of a CRT display, but it's a clear winner among LCD portables. Earlier models of the Pivot, which don't have the backlit screen, can be fitted with an upgrade for \$100.

What you get to read with all this improved clarity is a 16-line by 80-column display with 480- by 128-pixel bit-mapped graphics and a 25-line virtual screen. Although the Pivot screen displays only 16 lines at a time, you can toggle between the "top" and "bottom" of a 25-line display to obtain a virtual full-screen view.

Keyboard Economy

The keyboard on the Pivot flips down when you release the two slide latches at the machine's top. The 63 sculpted, full-travel gray keys provide fairly good tactile response. I found the action just a bit spongy, although not annoyingly so. Fairly long word processing sessions with the machine were quite comfortable and did not cause cramping or hand fatigue. Like the four cursor-control keys arranged in a line to the right of the spacebar, many keys have both shifted and unshifted functions. This principle underlies the design economy of the Pivot's keyboard, which uses fewer keys to offer the same functions as the IBM PC keyboard. Further economy is achieved by locating an embedded 22-key numeric keypad on a set of regular letter keys and using a single key to handle both insert and delete functions.

The most interesting part of the keyboard is the touchpad at the top. It includes the F1 through F10 function keys plus four icon keys: telephone, time/scheduler, diskette, and calculator. The telephone icon accesses the built-in modem and also turns the Pivot into an automatic phone dialer (the numbers that you have previously entered are displayed for auto-dialing). The calculator icon brings up a window in the right side of the screen for using the four-function, 16-digit calculator. You can use the calculator to set decimals, round or truncate numbers, and switch the window

FACT FILE

Pivot

Morrow Designs Inc.
600 McCormick St.
P.O. Box 5755
San Leandro, CA 94577
(415) 430-1970

List Price: 256K RAM model with two 5 1/4-inch floppy disk drives, \$1,995; 640K model with two floppy disk drives, \$2,795.

CIRCLE 754 ON READER SERVICE CARD

to the left side of the screen.

The diskette icon performs several functions. It will boot a diskette automatically and will also return to your disk-based application if you have used another icon to access the clock/calendar or the calculator. This icon is also the toggle switch for the virtual 25-line display.

The World at Your Fingertips?

The clock icon brings you back to the World Map display (which is your starting point when you turn on the Pivot) and cal-

The Pivot performs well,
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steadily and without fault.

endar for any other icon or program. The left side of what *Morrow* calls your Home Base display shows a monthly calendar with the time displayed underneath. You can use the function keys to change the day or month, and enter or look up your appointments till the year 2084 if you're that busy. You can set the appointment calendar to beep if you wish to be reminded of a specific appointment, although the Pivot will beep only if it is on. You can also press the zone functions (F7 and F8) to move a set of vertical bars across the time zones on the world map and find out what time it is in Reykjavik, Iceland, for example, if you need to know that sort of thing.

If you've been checking the time in the Solomon Islands or seeing what day your birthday falls on in the year 2332, you can return to the present time and date by pressing F6, which is reassuringly labeled HERE/NOW. The Home Base display also accesses the SETUP menu (F10), which configures printer and modem options, sets the initial time on the clock/calendar, and turns the RAMdisk on or off. These built-in functions are well thought through and, for the most part, they're quite useful.

Functional, Yes; Compatible, Maybe

The Pivot performs well, if a bit slowly at times. The disk drives tend to make noises that suggest they aren't interested in their job, but they work steadily and with-

out fault. *WordStar* booted in about 12 seconds, which is a little slow but not agonizing. However, the Pivot sailed through PC's prime number benchmark in 73 seconds—slower than an IBM PC but faster

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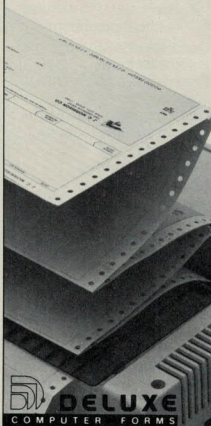
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THE PIVOT PORTABLE

than the more costly DATA GENER-AL/One.

NewWord, the word processor bundled with the Pivot, is a take-it-or-leave-it sort of program. If you know and are satisfied

with *WordStar*, you'll be quite happy with *NewWord*, which has some added functionality beyond the basic version of *WordStar* and a very similar command set. Otherwise you'll be looking for other

word processing software. Which brings us to the question, how compatible is the Pivot?

The answer is, somewhat compatible. It runs certain programs without a hitch, including *WordStar* and Lotus's 1-2-3; in fact, the Pivot comes with instructions for running 1-2-3 to make sure you have no problem. It also runs *Multipan* and *pfs.write*. However, it won't run *WordPerfect*, *DisplayWrite 2*, *Framework*, or *Intuit*. You can boot PC-DOS, although Morrow advises against it since certain functions, like the RAMdisk, won't work. In general, it seems hard to predict what will run and what won't.

Where does this leave you? Obviously, if you have a favorite program or programs

Pivot is somewhat PC compatible. It runs certain programs without a hitch, including *WordStar* and Lotus's 1-2-3. In general, however, it seems hard to predict what will run and what won't.

that you must run on your portable, you would be well advised to test them on the Pivot before buying. Morrow is certainly being candid—the company is not claiming 100 percent compatibility but is simply saying that the Pivot will run many IBM programs. However, the burden to verify any software beyond the programs that Morrow has tested is on you.

Pivot's Modem

Pivot's built-in modem is a direct-connect, auto-dial modem. It is easy to set up and proved reliable in operation. To use it you will need to buy a duplex jack and some telephone cable with the standard RJ11-C connectors (the modular connectors you probably have on your phone). The built-in communications software is perfectly straightforward and functional and includes a built-in timer that will keep track of your calls as well as provide sup-



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A hand is shown from the bottom right, holding a large, dark, three-dimensional block-letter logo that reads "MICROSOFT". The letters are thick and have a slight shadow, giving them a physical appearance. The hand is positioned as if presenting the logo.

THE PIVOT PORTABLE

port for tone or pulse dialing.

However, the modem/software combination has a couple of drawbacks which detract from their usefulness. You can't send or receive disk files with the built-in

modem software, and you can't use it as an auto-answer system. If you need these capabilities or high-speed transmission, you'll have to get additional communications software and/or an external modem.

The manual does indicate that Morrow might provide disk-based software to support file transfers at a later date, but for now, this is what you get.

Documentation

The documentation that accompanies the Pivot includes the owner's handbook, a

The owner's handbook is well done in every respect—the graphics are attractive and well executed, the drawings are clear and plentiful, and the copy is thorough and clear without being condescending.

very hefty *NewWord* user's guide, a not-so-hefty *NewWord* supplement, and three Microsoft MS-DOS manuals: a user's guide, programmers' reference, and a DE-BUG pamphlet. There are also a few additional typewritten sheets that cover corrections to the owner's handbook and the installation procedure for using 1-2-3 on the Pivot.

The owner's handbook is well done in every respect—the graphics are attractive and well executed, the drawings are clear and plentiful, and the copy is thorough and easy to understand without being condescending. It may not be the greatest literature in the world, but it will probably keep you interested while you learn about the Pivot. It is definitely a cut above most documentation.

Another matter worth noting if you are considering buying the Pivot is that Morrow is planning to release a 25-line version after July 15. The machine will retain the same plastic housing but will be substantially redesigned inside to provide "100% IBM compatibility."

In order not to leave 16-line Pivot owners with obsolete machines, Morrow is offering a trade-up policy: if you buy a 16-line Pivot now, you will be able to return it after July 15 with \$1,000 for the new 25-line model.

(continued)

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Some Closing Words

I liked the Pivot. While it lacks the dazzle and flash of the DG/1, the full compatibility of the Compaq, and the lap-top size of the NEC Starlet or Tandy 200, it is an

appealing machine on several counts.

You can use many IBM PC programs directly, without downloading or buying specialized versions of the software. Moreover, the Pivot's built-in programs

are useful. It's light weight makes it a true portable rather than a "transportable." The Pivot seems rugged enough to stand up to the abuse that a portable often faces and has by far the best display of any LCD portable to date. These features make it useful to many who need a PC portable that runs IBM disks directly and is easy to take on the road, use in a workspace at home, or carry between offices.

The current lack of total IBM compatibility might be a drawback for some potential buyers, and the lack of file-transfer capability in the telecommunications

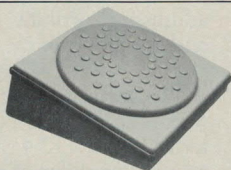
I like the Pivot. While it lacks the dazzle and flash of the DG/1, the full compatibility of the Compaq, and the lap-top size of the NEC Starlet or the Tandy 200, it is an appealing machine.

program will definitely be a drawback for others. Another is that the Pivot does not include a built-in version of BASIC.

On the positive side, however, the Pivot is a solid, utilitarian machine. It doesn't meet every need, but it doesn't try to. It does fulfill its stated functions capably and at a fair cost. The concept behind the Pivot is valid, and the execution is fairly strong. If the 25-line version comes out on schedule and with 100 percent PC compatibility, then the Pivot will be even more compelling. And the guaranteed trade-up policy is nice assurance for current owners.

Even without the expanded display and compatibility, the Pivot is a good machine and an attractive choice in the portable market. There are too many factors at play to predict the success of offerings from smaller companies. But based on merit alone, the Morrow Pivot deserves a fair shot. And buyers deserve the option of intelligent choices like the Pivot. ■

Jon Pepper runs a letterpress print shop in Vermont and does technical writing for companies such as Wang Laboratories and Digital Equipment Corp.



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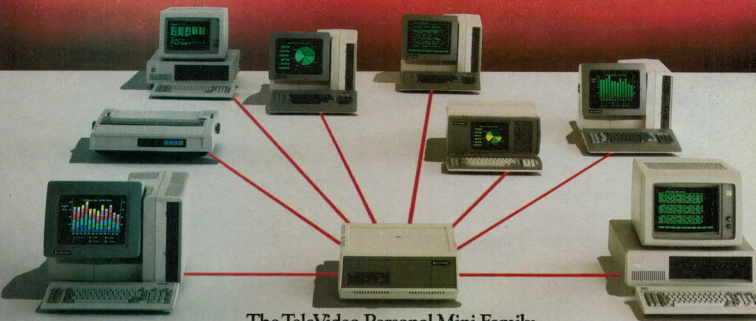
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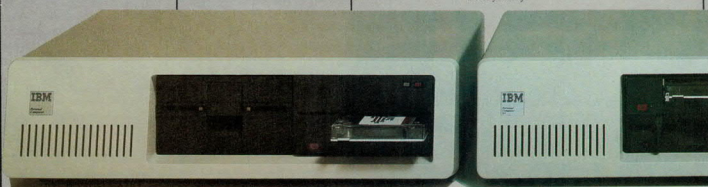
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For the most part, our drives are made with plated media,



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And they're 100 percent IBM compatible. The controller we send you for the XT is an upgraded version of the XT controller from the same company that makes the XT controller. In fact, the Express Systems controller is an improved controller which requires less power so that it is more reliable than any other standard controller.

We provide the power too. If you want to upgrade your IBM PC, there just isn't any way around upgrading your power supply—if you want to have true XT or better capability. Some companies say that their hard disks don't require any increase in power—and they might be right. But don't add anything to your slots, because the minute you do, you'll need more power. That's the bad news.

The good news is that our power supplies are inexpensive. How's \$99.50 for an XT power supply? We mean a full 100 watts of power. The other 30

means there is less chance to damage them. (Let's face it, the oxide that most disks come with is nothing more than rust.) We then test the drives and pre-format them; all you do is install DOS 3.0 so that you're ready to begin transferring files. We even include DOS 3.0 documentation.

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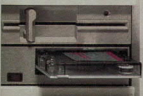
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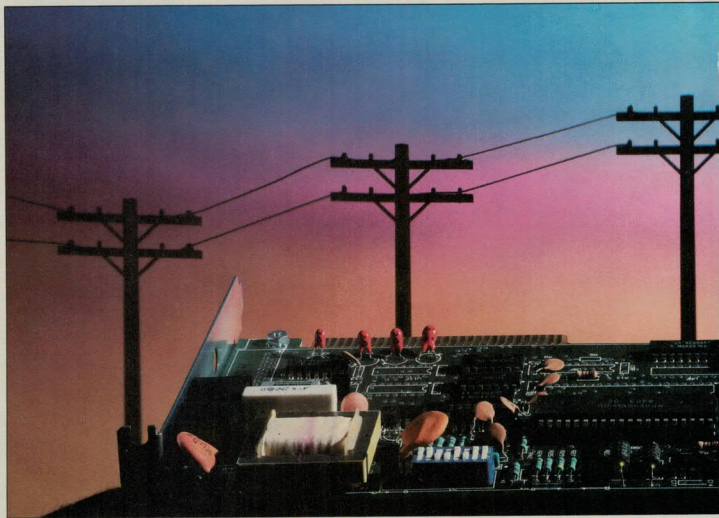


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OmniTel's Encore Performance

The Encore 1200B, Omnitel's new and well-designed internal modem, features true Hayes compatibility.



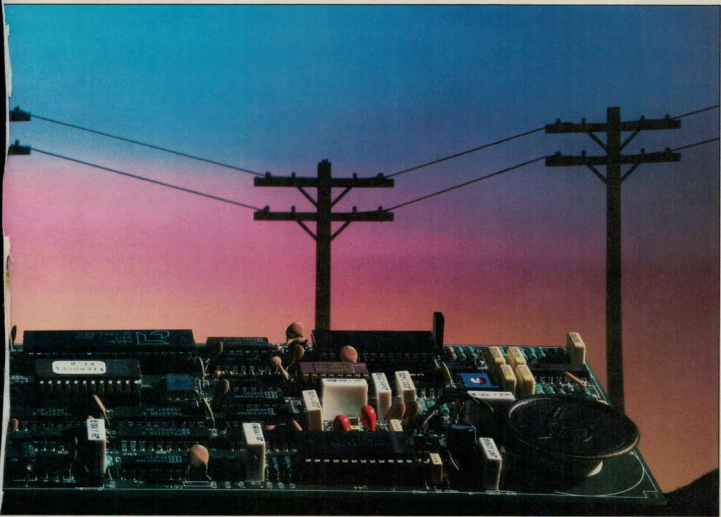
Given all the Hayes-compatible, 300/1200 baud, autodial, auto-answer modems on the market, it's hard to get excited over yet another one. But there is always room in the marketplace for a well-designed, low-cost product, particularly if it offers something beyond a "me-too" approach. The OmniTel Encore 1200B is trying hard to do just that.

True Hayes compatibility is an accomplishment itself. The Hayes 300, 1200, and 1200B Smartmodems all share the same on-board firmware—a simple program on a chip. This built-in intelligence lets you send commands to the modem by either typing them at your keyboard or using software to send the proper commands at the proper times.

The Hayes command set has become the de facto standard for intelligent modems and the communica-

tions programs that control them. Hayes compatibility typically means that a given modem uses the Hayes command set, more or less; some Hayes-compatible modems are more compatible than others. Most so-called Hayes compatibles don't have all the functions that you find on the Hayes. Others, which don't even share all the same commands for the functions they do have, can still claim Hayes compatibility because they share the most common commands. At least, they use the same commands for dialing and hanging up the phone.

An additional complication is that though a modem can share the full Hayes command set, minor design differences can still keep it from being completely Hayes compatible. Because of this, many "Hayes-compatible" modems will not work with *Smartcom II*, Hayes's communications program.



Photograph: Victor Schriber

The Encore 1200B appears to be fully Hayes compatible, or very close to it. Actually, the 1200B comes in two versions: the T1200-PC1 and T1200-PC1C. The T1200-PC1, which is reviewed here, is exactly equivalent to the Hayes Smart-modem 1200B. Its compatibility is so close that the Encore manual even includes the Hayes requirement for using uppercase only for the attention code that starts each command.

According to OmniTel, the Encore 1200B shares the complete set of Smart-modem commands, including all 19 basic commands and all 16 register settings; a random sampling bore this out. OmniTel also claims that the modem works with *Smartcom II*; a quick test appeared to bear this assertion out. As far as I could ascertain, it also works with several other programs, including *PC-Talk III* and *Omni-term 2*, without special coaching.

All that may be beside the point, however. OmniTel ships the Encore 1200B with *Crosstalk XVI*, the current release of one of the more sophisticated communications programs available—and one that you're not likely to outgrow. The program disk even comes with a bonus—a modified version of *Crosstalk* for the PCjr.

The Encore 1200B itself is a Bell 103/212A modem, meaning that it uses the Bell 103 communications protocol for talking to other modems at 300 baud and the Bell 212A protocol at 1200 baud.

Like the Hayes 1200B, the Encore 1200B is an internal modem. Installing it is no different from installing a graphics card or multifunction board. You simply remove the cover from your PC and slip the modem into one of the empty slots on the motherboard. All that remains is to

connect the modem to the phone line by plugging one end of a phone cable into the modem's modular connector and the other into a telephone wall jack. OmniTel supplies a modular-plug phone cord with the modem. You'll also find a second female modular jack on the modem, so you can plug in a phone.

Like most modems, the Encore 1200B includes several electrical jumpers and a bank of two-position DIP switches that you can use to set various options. These

The Encore 1200B comes as part of a complete communications package. *Crosstalk*, an integral part of that package, lets OmniTel come extremely close to the ideal of plug-in and go.

come preset for use with *Crosstalk XVI*, and you will probably not need to bother with them. However, there is one setting in particular that you may have to change.

As shipped, the Encore 1200B comes set for COM1. However, if you already have a serial port in your PC with a multifunction card or communications card installed, the odds are that it too is set as COM1. In that case, you'll have to reset the DIP switches on the Encore to tell the modem that it is COM2. OmniTel goes one step further and gives you the option of setting the Encore modem for COM3 or COM4, which is only helpful for the Columbia 1600 and the Zenith 150 and 160 on which COM1 and COM2 are already taken by their two serial ports.

Easy Operation

Once you get the Encore 1200B installed, getting started is unusually simple thanks to *Crosstalk XVI*'s NEWUSER script file. The easiest way to use *Crosstalk* is to create individual command files that contain the proper communications settings and other information for calling a particular system. Actually, *Crosstalk*'s NEWUSER does this for you. It asks you

for essential information like the phone number to call, the baud rate, and the name to store the file under, then creates the file for you. Calling another system then becomes a matter of loading the appropriate command file and telling *Crosstalk* to do its stuff.

Though the ease of use has more to do with *Crosstalk XVI* than with the Encore 1200B itself, the point is that the modem is marketed as part of a complete communications package. *Crosstalk* is an integral part of that package and lets OmniTel come extremely close to the ideal of plug-in and go.

A Manual Within a Manual

The integration of modem and communications program extends even to such niceties as having a single manual, which does a fairly good job of telling you what you need to know in the order you need to know it. The first 15 pages cover the modem and how to install it; the rest is a reprint of the *Crosstalk XVI* manual. This structure makes sense because once you install the modem, you need to communicate with it through the software.

Unfortunately, the manual does contain some oversights. One is that there is no list of the modem's commands or capabilities. Though this list is something many users can do without, particularly if they stay with *Crosstalk*, it is useful to have a list of commands to refer to if you want to fine-tune the settings.

Another problem is that the level of the technical writing is uneven. On the one hand, the manual takes pains to point out the obvious, for instance, that some components on the modem board can be damaged by static electricity. In its step-by-step instructions it includes such basics as "retain the screw that you remove, as it will be used later."

On the other hand, the manual assumes you know what COM1 and COM2 mean, not to mention such communications-specific jargon as Data Terminal Ready (DTR), Carrier Detect (CD), and Data Set Ready (DSR). DTR, CD, and DSR refer to specific electrical lines in communications ports. Some communications programs, including *Crosstalk*, use one or more of these lines to control the modem. Data Terminal Ready, for example, can be

FACT FILE

Encore 1200B

OmniTel
3090 Oakmead Village Dr.
Santa Clara, CA 95051
(408) 986-8236

List Price: T1200-PC1, \$399;
T1200-PC1C (with second COM
port), \$449

Requires: 96K RAM, one floppy disk
drive.

CIRCLE 796 ON READER SERVICE CARD

used to tell the modem when the PC is on and ready. Unless *Crosstalk* is loaded and set for auto-answer, the DTR line is off. This state tells the modem that the terminal isn't ready, and that the modem shouldn't answer the phone.

Many programs don't use these lines, however, and if you switch to a program that doesn't, you'll have to reset the DIP switches so that the modem will ignore the lines. With Data Terminal Ready, you have to "force DTR on." This phrase translates to setting the modem so it treats the DTR line as if the terminal is always on and ready. None of this jargon is explained in the manual.

In all fairness, most users will never need to know it since the DIP switches come set to work with *Crosstalk*, and that will generally be enough. Still, the manual carefully explains where the DIP switches are and how to reset them. It would be nice if it took the space to explain the jargon as well.

OmniTel says it is currently rewriting the manual, and the new version will add most or all of the missing information. In the meantime, you'll need to get a copy of the Hayes manual if you want to understand the command set on the Encore.

On the Air

If you have an early version of the modem, you may find that you unwittingly bought an AM radio along with an internal modem. The Encore 1200B has a speaker that lets you listen to a phone call. You'll usually want to set the modem so that the speaker turns on when the modem gets a command to dial and turns off once communications are established. When the speaker first turns on, what you should hear is a dial tone; what you may hear is an AM radio station. It turns out that the modem has a circuit resonant at 1310 kilohertz, right in the middle of the AM broadcast band. If you're close enough to a radio station, you'll pick it up.

Though the first modem sent for review had this problem, the additional noise from the radio didn't result in any increase in communications errors. The modem worked fine with text file transfers on MCI mail and with Xmodem protocol transfers on a local bulletin board. This result says a great deal about the Encore 1200B's superior

ability to slough off noise-induced errors.

Fortunately, the AM radio "feature" is a minor problem that is easily fixed. OmniTel has tracked down the guilty circuit and has solved the problem. If you have an early version of the modem, the fix is available at no charge.

OmniTel's Other Modems

The Encore 1200B is part of a full line of modems from OmniTel. Even the 1200B itself gives you a choice: while the T1200-PC1—the version reviewed here—is intended as an exact counterpart of the Hayes Smartmodem 1200B, its sibling, the T1200-PC1C, is not quite an identical twin since it has a second communications port. The addition gives you an internal modem plus a serial port on the same board—two functions in a single slot. You can plug in a serial printer or another modem at the second communications port. Either port on the dual-purpose board can be set for COM1, COM2, COM3, or COM4.

An external 300/1200 baud modem by OmniTel is also Hayes compatible and can toggle between Hayes mode and OmniTel's own command set. According to OmniTel, its own command set has some advantages over the Hayes commands and offers some extra features.

Other models included an external 300-baud modem, an internal 300-baud modem for the PC, and an internal 300-baud modem for the PCjr—remember that modified version of *Crosstalk XVI* for the PCjr!

About the only thing that's missing from OmniTel's current line is a 2,400-bits-per-second (bps) modem. This new class of modem sends information at 240 characters per second, using a relatively new protocol called V.22 bis. According to OmniTel, the company is working on a 2,400-bps modem. However, since even the new 2,400-bps Hayes modem isn't fully compatible with the old Hayes command set, OmniTel is waiting for the dust to settle before making its final design decisions.

It will be interesting to see what OmniTel finally comes up with. Judging by the Encore 1200B, this is a company to take seriously. ■

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SOFTWARE FOR HARD DECISIONS

It's your decision—and Decision Aide and Expert Choice, two new support programs, can help you define your problems, weigh your alternatives, and, ideally, make your selection.

How many nights have you tossed and turned, unable to silence the little voices in your brain? You just can't stop reviewing the arguments for and against a certain decision. After a night like that, you may be ready to trust your intuition and take a blind stab at the answer, just so you can get a good night's sleep.

Or perhaps you'll be ready for a bit of computerized help from your microcomputer. Two new software packages, *Decision Aide* from Kepner-Tregoe and *Expert Choice* from Decision Support Software, offer welcome help to the weary decision maker by presenting a systematic approach to the often confusing decision-making process.

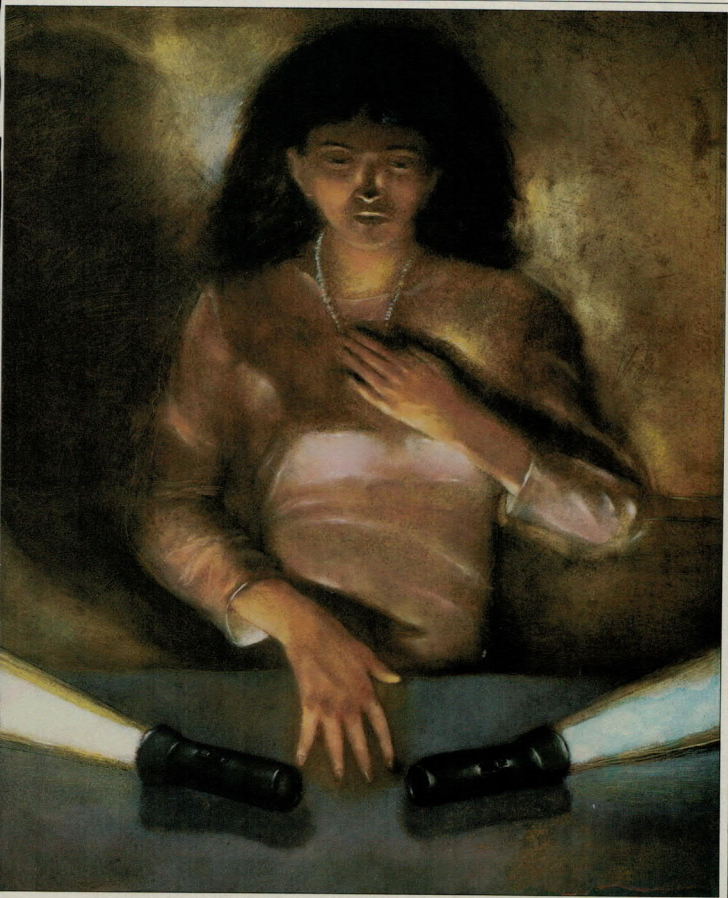
Both programs break down a decision into its component parts and ask you to analyze the parts before you reach a conclusion. This analysis eventually leads to a numerical score for each of your proposed alternatives, giving you a rough, quantitative idea of how well each alternative meets your goals. But the way each program guides you through this process is very different.

Decision Aide from Kepner-Tregoe, Inc., an international management consulting firm based in Princeton, New Jersey, is essentially an electronic workbook for Kepner-Tregoe's decision-making method called "decision analysis." This technique, developed by the firm's founders, social scientists Charles Kepner and Benjamin Tregoe, is a key part of the firm's "rational management" program taught at large corporations throughout the world.

Managers who already know how to use Kepner-Tregoe's decision-analysis technique will probably have the easiest time understanding *Decision Aide*, although the manual does teach the basics of the technique and includes a sample decision exercise to get you started.

As Kepner and Tregoe explain in their book, *The New Rational Manager* (Princeton Research Press, Princeton, N.J., 1981), decision analysis has five main steps. The first step is preparing a "decision statement"—for example, "Hire new vice president of research and development"—that expresses an action and the intended results of that action. The





second step is to establish objectives. In the case of hiring a new executive, objectives would be phrased as qualities of an ideal candidate for the job. A key part of this step is classifying the objectives into "musts" and "wants." A "must" objective is a measurable mandatory element (such as "2 years' supervisory experience"). "Want" objectives need not be measurable ("interacts well with managers at all levels"). Finally, you give each "want" a score showing its relative importance. This score is called the "weight" of the objective.

Step 3 involves generating and evaluating alternatives. Here you list possible courses of action and then grade them on how well they meet the objectives. The alternatives that fail the "must" objectives are eliminated from further consideration. You give each remaining alternative a numerical score that shows how well it meets each "want." You can then multiply each score by the weight of the objective and add the products together to give a composite score.

Considering Consequences

Instead of merely choosing the alternative with the highest score, Kepner and Tregoe have you go through one more step. They ask you to think of everything

that could possibly go wrong with each of the alternatives, then have you rank each adverse consequence on the basis of probability (high, medium, or low) and seriousness (high, medium, or low). Finally, according to Kepner and Tregoe, you're now ready to make a balanced choice that takes into account how well each alterna-

At each step, Decision Aide offers help if you're stuck. For instance, when you generate alternatives, the program asks a series of questions to help you brainstorm.

tive meets your objectives and how much risk it entails.

Decision Aide leads you through the steps of decision analysis, coaching you along the way as you answer questions about your decision statement, your objectives, and your alternatives. *Decision Aide's* main menu (see Figure 1) presents the system in outline form. It depicts the decision-making process as a circular path with eight steps: planning the decision, stating the decision, establishing objectives, generating alternatives, evaluating alternatives, assessing adverse consequences, making a balanced choice, and printing a report.

At each step, the program asks you a series of questions and offers help if you're stuck. For instance, when you're generating alternatives, *Decision Aide* asks a series of questions to help you brainstorm. Some are straightforward ("What ideas would your employees suggest?"), and some are whimsical ("What ideas would Shakespeare suggest?"). The point is to prod your imagination. If you want help, for instance, in thinking up adverse consequences, *Decision Aide* can ask questions to help you figure out what could go wrong.

When it comes time to multiply the weight of each objective by the score of each alternative, *Decision Aide* does the arithmetic for you and sorts the alterna-

tives so you can easily see which one has the highest score.

In addition to providing worksheets for decision analysis, *Decision Aide* produces a final report that summarizes your goals, alternatives, the possible adverse consequences, and the course of action you've chosen. If you're the lone user of decision-analysis techniques in your organization, you might have to explain the method and jargon to your coworkers.

Design Flaws

If you like using Kepner-Tregoe decision analysis, you'll probably like *Decision Aide*. Still, the program has a few problems. Some are outright bugs, and some are design flaws. None destroys the program's usefulness, but they can get in your way.

One design flaw becomes apparent when you first start *Decision Aide*. Before getting down to business, the program asks a few preliminary questions (see Figure 2). Unfortunately, once you answer these questions and move on to the main menu, you can't come back. If you decide to switch printers, send your report to a disk file, or work on a different decision, you have to exit the program and start it up again to get back to this preliminary screen.

Another design flaw appears in the first *Decision Aide* step, "planning the decision." In this step, the program asks a series of questions about the situation, and one of these questions leads you into an unexpected dead end. It asks innocently, "Does this situation require problem analysis?"

If you answer yes, *Decision Aide* tells you that although problem analysis is a good idea, the program is not designed to handle it, and then it instructs you to sign off and complete the problem analysis before continuing to use *Decision Aide*.

The manual doesn't offer much help. It mentions problem analysis as a technique "for those situations where something has gone wrong and you don't know why," but it doesn't explain how you are to go about it.

The version of *Decision Aide* I reviewed had some other bugs as well. For instance, when I tried to print a *Decision Aide* report on a serial printer, the printer



Decision Aide, Version 1.0

Kepner-Tregoe, Inc.
P.O. Box 704
Princeton, NJ 08542
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(609) 921-2806
List Price: \$250
Requires: 128K RAM, DOS 2.x, two double-sided disk drives or one disk drive and a hard disk.
CIRCLE 800 ON READER SERVICE CARD

Expert Choice

Decision Support Software, Inc.
1300 Vincent Place
McLean, VA 22101
(703) 442-7900
List Price: \$495
Requires: 128K RAM, DOS 2.x, one double-sided disk drive.
CIRCLE 799 ON READER SERVICE CARD

didn't advance the paper at the end of each line. Although the configuration screen has a linefeed parameter, the program wouldn't accept alterations in the parameter. Ultimately, I was able to fix the problem by flipping a switch on my printer that added a linefeed to each line that it received.

These problems are irritating, but none of them is catastrophic. *Decision Aide* can still be a useful tool, especially for organizations that already use the Kepner-Tregoe techniques.

No Hand-holding

Decision makers can get a different style of computer-based help with *Expert Choice* from Decision Support Software, Inc. Like *Decision Aide*, this program presents a structured approach to decision making—but *Expert Choice* doesn't take you by the hand, help you phrase your decision statement, prod your imagination, or remind you to consider adverse consequences—it assumes that you can take care of these details on your own. Instead, it concentrates on helping you identify and rank your goals and evaluate your alternatives.

Expert Choice uses a system called the Analytic Hierarchy Process, originally developed by Thomas Saaty at the Wharton School and described in his books, *The Analytic Hierarchy Process* (McGraw-Hill Int'l., New York, 1980) and *Decision Making for Leaders* (Wad-

worth Publishing, Belmont, California, 1982).

This decision-making process uses an inverted-tree diagram to illustrate the components of a decision (see Figure 3). The topmost node, or trunk, of the tree is the overall goal—for instance, selecting the most cost-effective computer. In this tree, the underlying nodes, or branches, that represent key objectives might be software availability and low price. The third level corresponds to the leaves of the tree, which represent the alternative choices—the computers under consideration. Note that each branch bears the same leaves, because *Expert Choice* evaluates how well each alternative meets each objective. There can be up to six levels in a decision tree, but the lowest level always contains the leaves—the alternative choices.

Draw a Tree

Expert Choice gives you a comprehensive set of editing commands to help you draw your decision-tree diagram. With a few keystrokes you can add or delete nodes from the diagram or enter node descriptions. Unfortunately, the writing space in each node is limited to eight characters, so you have to think up creative shorthand labels to express your goals and alternatives.

You navigate from node to node using the cursor-control keys, or, in larger diagrams, you may want to use the jump command, which allows you to go directly

to a particular node. *Expert Choice* will show only three levels of a tree at any time, but you can focus on any part of the tree by using the program's redraw command. *Expert Choice* also includes a replicate command that duplicates the leaves at the bottom of the tree onto a number of different branches.

Once you've drawn the tree, you can rank your goals and alternatives. You do this by making "pairwise comparisons"—that is, *Expert Choice* presents the nodes of each level, two at a time, and you judge which is more important (or more likely or more preferable) and by how much. You compare the nodes using either a verbal or a numerical scale. You can see an example of the verbal mode in Figure 4. Using the cursor-control keys, you move the arrow to one of nine positions on the scale from equal to extreme. In this example, software availability is "strongly" to "very strongly" more important than cost.

Or, you can use a numerical scale, as shown in Figure 5. Here, the scale of odd integers from 1 to 9 indicates the relative importance of the goals. In this case, I decided that software availability is six times more important than computer cost. This screen also displays a matrix showing the pairwise comparisons of the other nodes on this level.

Expert Choice comes with a validation example that compares the final results achieved by these two methods. The exer-

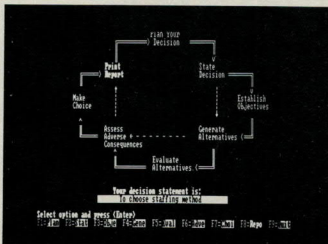


Figure 1: Decision Aide's main menu depicts the decision-making process as an unbroken loop.

The screenshot shows a window titled 'DECISION AIDE' with a sub-header 'CONVERSATION QUESTION BY KEPNR-TREGOE'. The text inside asks: 'Now is the record of your most recent decision:'. Below this is a list of seven numbered questions with user input: 1. Your name is..... (JOHN PETERMAN), 2. Your company name is..... (PC Magazine), 3. Your decision data file has the name..... (DATA), 4. This decision is dated..... (01-01-1988), 5. Program files will be stored on disk drive..... (A), 6. Decision data will be stored on disk drive..... (A), 7. The printer port you are using is..... (LPT1). At the bottom, it says 'Press (ESC) key to end input or get help.'

Figure 2: The program picks your brain for basic information before you can begin working toward a decision.

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DECISION MAKERS

case asks you to compare five geometric shapes. In the first set of comparisons, you use the verbal scale to indicate the relative size of the shapes, estimating, for instance, that the circle is "strongly" larger than the triangle, and so on. In the second set of comparisons, you use the numerical scale, judging this time that the circle is, say, six times larger than the triangle. The two methods produced almost identical results.

After you complete the comparisons, *Expert Choice* calculates a value for each node to indicate its relative importance. To help you visualize this result, the program draws a bar graph representing the value of each node (see Figure 6).

When you move down to the next level, you again make pairwise comparisons for each set of leaves. *Expert Choice* comes up with a score for each alternative, showing how well it achieves each goal, and a composite score showing how each alternative ranks overall.

Real-life Comparisons

According to the *Expert Choice* manual, comparing the nodes in pairs has two advantages over the continuous scale used in systems such as *Decision Aide*. First, comparing two objects is easier than comparing several objects and more likely to yield accurate results. Second, this comparison method allows for the inconsisten-

cy that crops up in some real-life situations. There's no way a continuous scale can express some real-life relationships, such as, "the Raiders are stronger than the Dolphins, who are stronger than the Packers, and yet the Packers sometimes beat the Raiders." However, a model that uses pairwise comparisons can express this kind of inconsistency.

If your judgments are inconsistent, *Expert Choice* will tell you so with an inconsistency ratio. If this ratio is higher than 0.1, the manual advises that you review your judgments to make sure that you haven't made an error. *Expert Choice* includes a set of built-in commands that point out your most inconsistent judg-

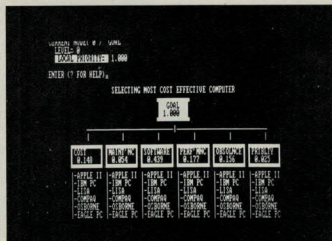


Figure 3: *Expert Choice* uses a tree format to organize the information on which you will base your decision.

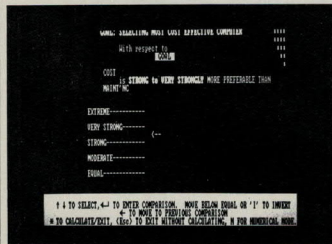


Figure 4: In this *Expert Choice* mode, you use words to express your preference for one of two alternatives.

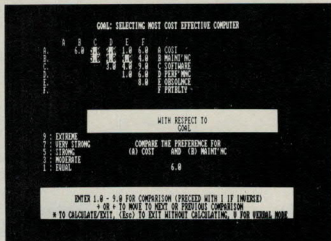


Figure 5: If numbers are more meaningful to you, you can compare pairs of alternatives on a numeric scale.

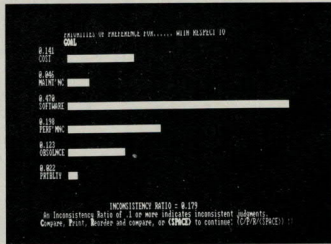


Figure 6: *Expert Choice* summarizes your pairwise comparisons by drawing a bar graph.

ments. However, if you discover that the inconsistency in your model reflects real-life inconsistency, the high ratio does not interfere with the continued operation of the program.

When you've completed all of the pairwise comparisons in your tree, *Expert Choice* prints a report showing how well the alternatives in your "leaves" stack up against each other. The report is terse and makes liberal use of the program's specialized terminology. If you want to show it to someone unfamiliar with the analytic hierarchy process, you'll have a lot of explaining to do.

Despite its formidable terminology, *Expert Choice* is a relatively easy program to learn. The manual explains the program in great detail and uses several sample decision files that come with the program. It also does a good job of explaining the analytic hierarchy process and how it can be used in group decision-making. One inconvenience is Decision Support Software's copy-protection scheme; however, the company will send you a free backup disk when you send in your registration.

Choosing a Program

How do these two programs stack up? Each offers a structured approach to decision making with different strengths and weaknesses. The models in *Expert Choice* are easier to modify, and its multilevel structure makes it better suited for organizing very complex decisions. Also, the program shows no irritating design flaws or bugs. On the other hand, devotees of the Kepner-Tregoe methods would enjoy *Decision Aide*, which offers more help in preparing the groundwork for the decision and produces a more readable report. Decision makers with a limited budget might also prefer *Decision Aide* because it costs about half as much as *Expert Choice*.

Testing a sample decision with both programs yielded almost identical results. That's not surprising when you consider their fundamental similarity: Both programs force you to pay attention to your goals and their relative priorities before you begin evaluating alternatives. So, depending on your goals and priorities, choosing one of these programs is a decision you'll have to make on your own. ■

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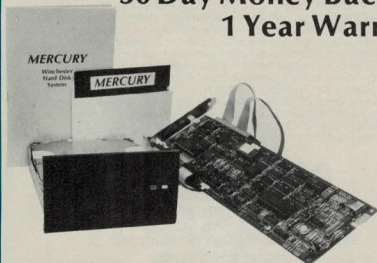
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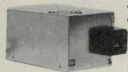
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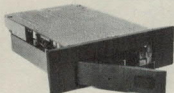
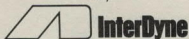
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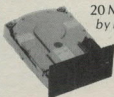
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CIRCLE 126 ON READER SERVICE CARD

Negotiating One-Upmanship

A new software genre has sprung up that purports to offer business people individualized guidance.

Exemplifying this type of software, The Management Edge helps you deal with your coworkers, while The Art of Negotiating aids you in refining your bargaining strategies.



At prices somewhere between *The One-Minute Manager* and 2 year's tuition at Stanford Business School, business skills-and-strategies software seeks to offer managers individually tailored approaches to help negotiate, manage, counsel, and assess coworkers, bosses, subordinates, and the public.

The Management Edge by Human Edge Software and *The Art of Negotiating* by Experience in Software are typical of this small but growing genre.

The Management Edge offers you a plan for dealing with others in your company based on your own personality traits, those of other workers, and on the general attitude of your company. A spokesperson for Human Edge Software, which was formed in 1983 by clinical psychologist Dr. James Johnson, says there are "acknowledged pieces of advice" for given situations. You tell the PC the situation; the program digests it and gives you the advice.

The Art of Negotiating helps you prepare for an upcoming negotiation by having you and your assistants examine the issues involved, your objectives, the concerns of the other side, and some possible strategies. The program is based on a series of books and seminars by Gerard I. Nierenberg. Experience in Software calls Nierenberg "the father of contemporary negotiating." *The Art of Negotiating* doesn't offer solutions as much as it forces you to focus on the task at hand and then

outlines your input information on screen or on paper.

The Management Edge

The Management Edge is one of four \$195-\$295 business strategy programs from Human Edge Software of Palo Alto, California. Other software in the series are *The Sales Edge*, *The Negotiation Edge*, and *The Communication Edge*.

Management Edge's copy-protected disk offers self-assessment and assessments of your subordinates, your boss, and your company. You're asked to agree or disagree with a series of statements and personality descriptions about each person and the company in general. The program then grinds away—actually, it doesn't take much longer than deciding between a Big Mac and a Quarter-Pounder—and suggests a course of action.

To believe in *The Management Edge*, you have to accept that psychologists can get a pretty good idea about what makes you tick based on your likes and dislikes (for example, "I often worry too much about work," "I am against capital punishment"). These types of questions are the basis for many tests used to determine everything from who should be entrusted to protect the president to who's sane enough to stand trial for an ax murder. You also have to believe that a reasonable, nontrivial version of such a test can fit into 400K of Pascal code and text file.

The Management Edge's 175-page,

ONE-UPMANSHIP

IBM-size documentation comprises four sections: a user's manual, a quick reference guide, a summary of the fundamentals of management, and a set of contact records to document your meetings with subordinates and note your impressions of them by ticking off any of 104 adjectives that may apply (from achieving and ambitious to wary and worrisome).

The Management Edge can store information on a manager (yourself), a company, and as many subordinates and superiors as a disk will hold. Setting up the program for the first time takes an hour or so. It might have been quicker if the manual provided more technical help, such as whether you can use a hard disk (you can't) or whether you can use both drives on a two-drive system. Updates to analyze a new employee or situation could take 15 to 30 minutes.

Using the Edge

I booted up the copy-protected program and laid out a mythical workplace scenario with several hundred white- and blue-collar employees with temperments ranging from Type-B personalities to outright catatonics, sprinkled with a few aggressive middle managers and some laid-back upper management. Pay scales are mediocre to adequate, almost no one gets fired for incompetence (the union might object, and besides, the company is making enough to carry a little deadwood), and



The Management Edge

Human Edge Software Corp.
2445 Faber Pl.
Palo Alto, CA 94303
(415) 493-1593
List Price: \$250

Requires: 128K RAM, one disk drive.

CIRCLE 696 ON READER SERVICE CARD

The Art of Negotiating

Experience in Software, Inc.
2039 Shattuck Ave.
Berkeley, CA 94704
(415) 644-0694

List Price: \$495

Requires: 256K RAM, two disk drives or one disk drive and hard disk.

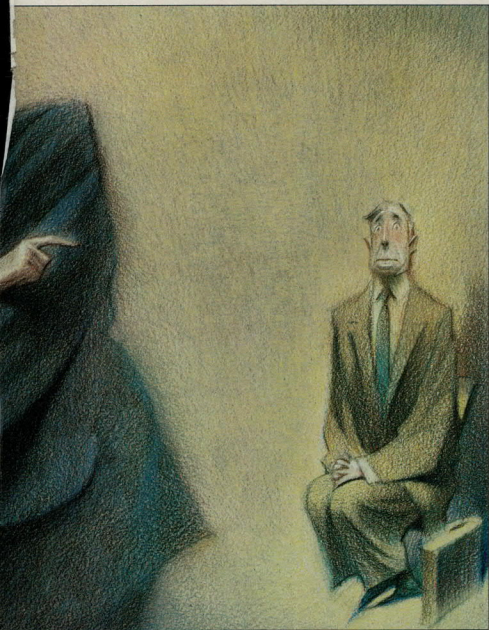
CIRCLE 695 ON READER SERVICE CARD

internal advancement is slow but possible. Sound familiar?

The first part of the program involves self-assessment. *The Management Edge* offers 80 agree-disagree statements on screen, one at a time, that examine your managerial attitudes and opinions. You get quizzed on such beliefs as, "The concept of a good company man is outdated" and "Being popular at work is important to me." Some statements are loaded, such as "I would like working in a one-person

office." Do you want to tell a machine you have loner tendencies if you're supposed to be a manager?

Other sections deal with interaction with others, compatibility with your organization, problem solving with subordinates, determining your management skills, and assessing your superior. Once you have completed the self-assessment and at least one other section, *The Management Edge* offers an on-screen or printed analysis on those areas.



Based on my theoretical scenario, *The Management Edge* reported, "Managers such as yourself typically expend a good deal of energy maintaining a friendly, relaxed work atmosphere. . . . While subordinates may be members of one big, happy family, that family is likely to be an idle one as well."

About the boss, *Management Edge* said, "Because Mr. _____ is minimally invested in his position, you will have to work hard to overcome his managerial

deficiencies." Concerning a subordinate that was described as a perpetual pain, *The Management Edge* says, you should "go easy on Mr. _____; he is not likely to be a recurrent behavior problem."

Most of the reports run less than half a page, while an analysis on the interaction between a manager and a specific employee could run 8 pages or more if added options are chosen. The reports are combined from text files already on disk, then semicustomized by inserting descriptive

adjectives chosen earlier in describing yourself and others (see Figure 1), Mr./Mrs./Ms. titles, and the subject's initials. Which paragraphs are output depend on the descriptions of yourself and your coworkers.

Some of the insights seem interesting, while others might be trivial or misleading. You buy a \$250 program, tell it nobody works very hard, and the program spits back, "Nobody works very hard."

No matter how saintly you make the other guy seem, *The Management Edge* generally suggests the flaws lie with the other person.

No matter how saintly you make the other guy seem, *The Management Edge* generally suggests the flaws lie with the other person, not with yourself. That's probably what you want to hear, but is it always accurate?

The Art of Negotiating

The Art of Negotiating is a "self-help expert process" or a piece of "human-potential software," according to Roy Nierenberg, president of Experience in Software and son of Gerard Nierenberg.

The most obvious difference between this program and *The Management Edge* is that *The Art of Negotiating* offers no answers or suggested courses of action. It's similar to an outlining program or thought organizer devoted exclusively to negotiating.

In addition to the copy-protected program disk (a back-up is included) and an IBM-size reference manual, there is a 400-page textbook, *Fundamentals of Negotiating* by Gerard Nierenberg, and a workbook. The program calls for 256K RAM, and even that's a tight fit. You may have to clear auxiliary programs such as *ProKey* from memory and dump some nonessential DOS files, such as CONFIG.SYS if it includes memory-absorbing BUFFERS or FILES statements. About 237K of free memory is needed after DOS is on board.

ONE-UPMANSHIP

You work through eight modules: subject matter, objectives, issues and positions, fact-finding, needs and gambits, climates, strategies, and agenda.

The first six modules ask you to describe and rank the importance of your objectives and those of your "opposer" (that term is preferred to "opponent," which sounds too warlike). You're asked to describe issues and positions from your viewpoint and from your opposer's, and then to check off issues both sides might be willing to concede. Space for answers is limited, which might seem stifling to some. Your opposer's name can have no more than 13 characters, and other descriptions can't take up more than 40 or 55 characters.

The other two modules require you to pick the best applicable answers from a fixed menu. You choose from 14 negotiating topics and 29 negotiating strategies. Brief explanations of all negotiating terms and concepts are available on-screen and are explained in great detail in the accompanying text (see Figure 2).

After you're all done (a session might run 2 hours), the program gives you a printout of your planned course of action. If you covered all eight modules, the printout will run to 10 pages or more. The program makes no attempt to analyze the situation or suggest that you made good or bad choices. Rather, the printout is a recitation of the information you entered.

The Art of Negotiating requires a great

deal of educated guessing on your part. You must decide, for instance, which of the 29 strategies you believe your opposer will use. The bottom line is that this system is really no more skillful than the person using it.

The information in the \$495 program is also covered in Nierenberg's negotiating

The Art of Negotiating requires a great deal of educated guessing. It is really no more skillful than the person using it.

textbooks, which are much less expensive. So what does your \$495 buy beyond a fancy outline capability? Experience in Software claims three extra features: The areas covered vary, depending on your initial answers, so *The Art of Negotiating* is somewhat "tailored" to specific situations. The company contends the program "streamlines preparation time" by sorting lists of negotiating priorities faster than you could by hand—but I feel a database could do so just as well. With a textbook, if you're stumped by a tough question, you can turn the page; *The Art of Negotiating* won't move ahead until you confront each issue. This limitation forces you to consider the other side's point of view.

Some negotiators may find the money well spent because it allows you to quickly

assemble and print a strategy report that you can pass along to your assistants.

Technically, the program is well put-together and suffers from no obvious bugs (just don't accidentally hit Ctrl-C or Ctrl-Brk or you'll be ejected unceremoniously to DOS). Function keys F1 and F2 are used to call up general or specific help screens, and F10 is used instead of the Enter key to continue along. The beep generated if you make an error is obnoxiously loud—so loud that the reference manual calls it a "Klaxon."

Worth the Money?

Should you buy *The Management Edge* or *The Art of Negotiating*? *The Management Edge* condenses the knowledge of a Ph.D. onto disk in useful form, but it's still in the trial-and-error stage. While the suggestions the user gets back aren't outright wrong—and some are indeed helpful—they can be a bit vague.

The Art of Negotiating doesn't tell you what to do, so you can't fault it for offering vague or incorrect advice. Rather, the question here is how much value you'll get beyond the \$10 to \$25 you'd spend on a negotiating textbook. If this were a \$25 textbook package with an additional \$25 disk option, it might be a better deal.

Perhaps more-sophisticated and less-costly business skills-and-strategy programs will evolve in the near future. For now, some users may find management-analysis software a trivial pursuit. ■

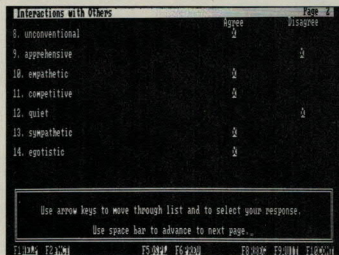


Figure 1: The Management Edge provides adjectives with which you can assess yourself and others in your company.

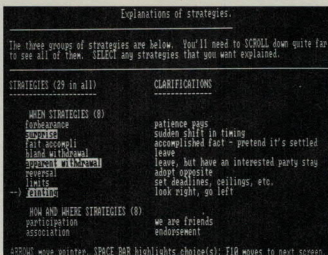
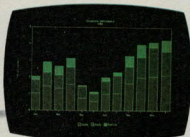


Figure 2: An explanation screen from *The Art of Negotiating* detailing 3 of the 29 defined negotiating strategies.

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Photograph: View-Stranger

THE DATATOWER OF STRENGTH

Priam Corporation's DataTower Hard Disk Subsystem brings 8-inch hard disks to the PC. It also brings a minicomputer design philosophy that stresses data integrity over equipment cost.

If you're of the old school and believe that bigger and heavier mean better, have I got the mass storage solution for you. The Priam DataTower DT01-03 is built for those who measure value by the pound and would drive a Sherman tank down I-95 if only they could find one with cruise control.

If you're of the new school and believe stuffing a microprocessor into any kind of machine makes it inherently better in some way, the Priam may pleasantly surprise you, too. Not only does it sport its own microbrain (actually two of them), but its performance puts ordinary hard disks to shame. As a matter of fact, about the only penalty accompanying the fast and intelligent DataTower is the sag it will leave in your floor.

I'm hardly exaggerating. The DataTower arrives on your doorstep in a box that's big enough to wrap a studio piano; you may need to enlist a friend's services to help you wrestle it into place. The mechanism is so massive you can feel it thumping as it works, even when you're just standing nearby.

Numbers alone make the DataTower an impressive piece of equipment. Its hard disk capacity is approximately 75 megabytes, with average access time rated at 35 milliseconds. (Other versions of the unit use even bigger drives to reach capacities of 160 and 292 megabytes.) Priam claims the optional tape backup unit that fits in the same chassis can stream 45 megabytes onto a 450-foot DC-

300XL cartridge or 60 megabytes onto a 600-foot DC-600A cartridge, although the current Priam software limits each cartridge backup to 33 megabytes.

All of this capacity is packed into a sturdy 80-pound monolith, 26.5 inches high by 9 inches wide by 20 inches deep, that might not feel out of place in a Stanley Kubrick movie. Like that other famous monolith, the DataTower is designed to stand on its own one foot, immobile until at least 2001.

The DataTower may be heavy, but it's a nimble performer when connected to a PC, XT, or AT. Faster, at least subjectively, than most lightweight add-on disk drives, its robust construction gives you something most PC-sized Winchesters can't: a good night's sleep. Backed up by its built-in streaming tape drive, it offers the security of a massive 8-inch hard disk built around minicomputer, not microcomputer, philosophy. The credo behind the Priam DataTower DT01-03 seems to be that the integrity of your data comes first; cost is secondary.

The workmanship of the DataTower and its subassemblies—such as the Archive cartridge tape transport and a 400-watt power supply that looks as if it might be capable of lighting Manhattan—can't help but inspire confidence. Also inside the sturdy steel shell you'll find a cast aluminum drive unit in which is sealed a stack of three 8-inch hard disk platters: unmistakably unusual in the 5 1/4-inch

world of PCs. The difference between the DataTower and most other hard disk subsystems is, however, much greater than a mere 3 inches of disk diameter would lead you to believe. Eight-inch Winchesters come from the world of minicomputers, where they play the computer game by different rules.

The primary design goal of 5¼-inch hard disks is to maximize the bytes per buck. On the other hand, 8-inch drives come from the world of big business and industry, where cost is only one factor in equipment design—and one that's often pushed aside by the bigger concerns of data integrity and reliability. Business computer professionals know that the downtime that's avoided by heavy-duty equipment far outweighs the initial price penalty.

Of course, size alone does not assure quality and reliability. Many other 5¼-inch drives are built tough, too, and most have excellent reliability ratings. But along with its bigger size, the Priam drive boasts several reliability-enhancing features that only the cream of the smaller drives can match: dedicated head-landing zones, spindle and head locks, integral shock mounts, and a linear voice-coil head-positioner. In contrast to the stepper motors used with inexpensive disk drives, the voice-coil-controlled head positioner of the DataTower gives it both speedier access times and greater immunity to power line vagaries.

The system constantly energizes the voice-coil to pull the read/write head away from its landing zone (where it can safely touch down on the disk surface without harming your data). When the electric supply takes a precipitous drop—or you turn the DataTower off—the tower's read/write head fully and safely retracts before the big disk slows appreciably. The inertia of the

disk keeps it spinning, which keeps the head flying long enough so that it cannot crash down and lay a row of craters on the delicate surface of the DataTower's oxide-coated platters. Smaller disks slow down more rapidly, and stepper-motor positioners usually don't retract automatically when the power stops, resulting in the need to follow elaborate turn-on and turn-off rituals to prevent disk damage.

Moreover, as the power in any Winchester drive (or even a floppy disk drive, for that matter) disappears, its swan song may be to uncontrollably send signal pulses to the read/write head. If the head is poised over the disk surface, such pulses can erase or modify random bytes stored on the disk. All those watts on hand in the

While the disks in the
DataTower may
deteriorate with age,
the information you
store will be secure. In
fact, you may never
again see DOS complain,
“Disk Error.”

beefy DataTower's personal power supply keep the system alive for a few additional, crucial milliseconds after the power abruptly fails, thus protecting against random disk-writes.

The DataTower is also smarter than your average drive. In addition to using an Error Correction Code (ECC) to detect and repair disk errors up to 5 bits long (as do most drives), it also permanently solves the DOS-plague of bad sectors. (DOS does not reliably mark all bad sectors on big disks.) Not only does the DataTower find all bad sectors and hide them from DOS when you format its disks, but it also continuously watches for sectors that even might go bad while the disk is in use, preventing read and write errors before they can happen.

Most 5¼-inch Winchester systems search for bad sectors only at format time, so that if a sector goes bad later—perhaps when you trip over the drive during the corporate Christmas party—the machine

cannot do anything about it, and your data is at risk.

The DataTower constantly monitors its hard disk as you use it. If, while writing to the disk, the DataTower's controller detects a sector that's gone bad, it automatically takes note, looks for a suitable replacement, and writes the data there. Should it find a bad sector while reading from the disk, the DataTower corrects the data before passing it along to your PC, then quickly copies the corrected bytes to a good sector and marks the sector in which the error originated as bad.

The end result is that while the disks in the DataTower may deteriorate with age (as all magnetic storage media do), the information you store will be secure. In fact, you may never again see DOS complain, “Disk Error.”

Adding on the Tower

Installing the DataTower hardware is a relatively painless 5-minute job, once you maneuver it into its final resting place. Slide a single expansion card into your PC, plug in both ends of the cable—about as thick as your thumb—and turn on the power. Unfortunately, the adapter card is the DataTower's one amateurish component. Laced with more add-on jumper wires than there are circuit traces etched on the card, it more closely resembles a patchwork quilt than a finished product.

Software installation is a bit more troublesome, partly because the DataTower manual is an optometrist's dream made up of hard-to-read, blotchy, badly duplicated computer-generated copy. The directions themselves are straightforward though, with specific instructions for PCs and XT's—but no mention of the AT.

The lion's share of the installation process is handled by PDISK, which is patterned after IBM's FDISK but whose functions include disk formatting, partitioning, backing up, and restoring.

Because normal PC-DOS can handle only 33 megabytes on a single disk, the DataTower's 75 megabytes must be partitioned into at least three virtual disks or volumes. PDISK defaults to two volumes (partitions) holding 33,464,320 bytes each and a third holding 8,040,448 bytes. If you don't like that arrangement, you can select whatever volume size you want, for up to a



DataTower DT01-03

Priam Corporation
20 W. Montague Expressway
San Jose, CA 95134
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total of four volumes (none larger than the DOS limit).

You can use one volume to boot your PC (but apparently not an XT or AT) without a floppy, providing you have a late-model PC with the capacity to accept 64K RAM chips on the motherboard. My system includes a 10-megabyte non-IBM add-in hard disk; I discovered that the DataTower considered it to be an XT.

When I removed the other hard disk from my system, the DataTower did, indeed, boot my system from its internal Winchester. The hard disk boot process took a few seconds longer than with most systems, however, and was accompanied by the sounds of a small woodpecker trying to peck its way out of the tower.

Unlike other boot-from-the-hard-disk systems, the ROM code that the Priam controller uses allows your PC to find only one of the DataTower's volumes. To use the others, you must add a program called PHDVR.SYS to the boot volume's CON-

FIG.SYS file. After it's installed, the DataTower acts like any other add-on disk, or disks, and accepts whatever you might send to its drive letters. The only control is an on/off switch.

In theory, the DataTower should be fast; it lists an impressive 35-millisecond access time on its specification sheet. And when I used it, it seemed to load programs and save data faster than most hard disks I've tried. However, performance tests, strangely, did not confirm my subjective observations. On *PC Magazine's* standard read/write test of 10 repetitions of 20 1,024-byte records, it clocked in at 20 seconds for writing and 14 seconds for reading, an average-to-slow result. On *PC's* add-in drive benchmarks, writing 200 kilobytes of 512-byte records required 15.49 seconds. A random reading of 256 of those records took 14.17 seconds, and a sequential reading of the same number of records required 7.3 seconds. These results are also in the middle of the pack.

To Tape

The DataTower uses standard streaming 1/4-inch tape cartridges for backup—a good compromise for cost, speed, and convenience. Using nine tracks of serpentine recording (the tape shuffles back and forth, end to end, recording in each direction), the DataTower stores up to 45 megabytes on a 3M DC300XL cartridge.

Alas, Priam's backup software does not match the high quality of its hardware. Its shortcomings prevent you from writing more than 33 megabytes—the contents of a single partition—to a single cartridge. Whole-volume backup permits only a single partition to be loaded onto a tape. File-by-file backup allows you to record only one backup session (with all files coming from the same DOS partition) on a single tape. You cannot subsequently add additional files to a cartridge without erasing the original files.

Although its underlying design may be obsolescent, Priam's software is easy to

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use. To back up a full volume, you need only run the menu-driven PDISK program and slide a tape into the drive. The tape springs into action and races back and forth through the machine, only occasionally pausing to take a breath. It took 8 minutes, 29 seconds, to back up a full 33-megabyte volume, and restoring the same volume took the same amount of time.

The restoration process is not without shortcomings, however. Although you need not restore a volume to the same physical disk it came from (safeguarding your data even if your DataTower disk drive must be replaced and allowing you to use the tape to shuttle data between different DataTowers), you must restore the volume to a partition exactly the same size as the one you backed it up from. Moreover, you cannot restore individual files from a full-partition backup.

Although the PDISK backup and restore operations involve nothing more than shifting data from one device to another in-

side the DataTower, and both of these devices have intelligent controllers with their own microprocessors, the operations run in the foreground on your PC. Consequently, you cannot use your computer for other chores while tape is streaming through the DataTower.

Priam supplies a pair of programs, TBACK and TREST, to help you back up and restore individual files and groups of files to tape. Like DOS's BACKUP and RESTORE commands, the Priam programs recognize ambiguous filenames, search directories, and select files by date or archive bit. The only operational difference is that the two T-programs work only with the Priam tape drive, although any disk drive (including a floppy) in your system can be the source for TBACK or the destination for TREST. File-by-file backup of a 33-megabyte volume completely filled with several large files required 18 minutes, 13 seconds. Restoring it required only a few seconds more than that.

The T-programs have their dumb sides, too. TREST restores files only to a directory with the same name as the one from which they were backed up. TBACK waits until the end of the backup process to reset archive bits: a theoretically good idea that results in a minute or more of vigorous disk exercise. Error messages are accompanied by enigmatic code numbers. Although the software works as is, a few minor revisions would be welcome.

Ruggedness is clearly the DataTower's best feature. Its physical durability translates directly into durability for your data. Given its huge capacity, a DataTower might be very happy connected to the server of a medium-size network. It's probably overkill for a single PC unless you deal with large databases or other applications requiring unusually large amounts of fast on-line storage.

Winn L. Rosch is a contributing editor of PC Magazine.



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Software Takes to the Air

There's a quiet revolution brewing in Seattle. Residents there can't see a thing, yet the winds of change fill the air over Puget Sound. The budding revolution may prove to be a milestone in communications rivaling KDKA's radio transmission of the 1920 presidential election returns and NBC's broadcast of the opening ceremonies of the 1939 New York World's Fair, the beginning of regular television service. These events marked the advent of "voice by radio" and "pictures by radio." Today, a new phenomenon adds another dimension to broadcast—software by radio.

To the casual listener, radio station KAMT's "Sofcast" program, produced by the National Digital Network, resembles any number of talk shows that ride the airwaves. News, interviews, and advertisements, all on the subject of computers, are presented by loquacious announcers who spice up the interludes with humor, catchy musical scores, and synthesized sound effects. Where "Sofcast" digresses radically from conventional radio programs is a 10- to 20-second interval during which the broadcast has no meaning to the human ear. Instead it is directed to the audio sensors of a computer.

Specifically, the computer transmission consists of a burst of programs or data shipped at a rate of 2400 baud (240 characters per second) on AM and 4800 baud on FM. Listeners have described the transmissions as a hum or static. Experienced modem users identify them with the sound

a modem makes when it encodes digital signals over the telephone.

Although unintelligible to humans, these signals are music to the ears of computing enthusiasts, who can harness the airborne software with a radio, personal computer, and a \$70 device called a Shuttle Communicator. Best of all, like listening to any radio broadcast, it doesn't cost a dime outside of the original investment in equipment.



Mike Darland: "We're giving America data, programs, and electronic information at a price it loves—free."

Sofcast Origins

"Sofcasting" owes its inception to Microperipheral Corporation, a modem manufacturer based in the Seattle suburb of Redmond, Washington. The company started out 5 years ago making quality modems for Radio Shack and Atari computers. As the modem field became saturated with vendors, Microperipheral president Mike Darland starting looking for alternative products.

"The problem with modems," said Darland, "is that few people, with the exception of business users, really need them. Only 15 percent of the installed base of personal computers have modems. Why so few? Because they don't fulfill a need. Why should users buy modems costing several hundred dollars and then pay an on-line information service 7 or 8 dollars an hour for data retrieval? What do they need to know at that price that they couldn't find out at the library?"

"What we're doing," Darland continued, "is giving America data, programs, and electronic information at a price point that America loves—free."

Darland hopes to deliver free software to the computing masses by following the successful formulas pioneered by radio and television, that is, backing programming with advertiser revenue. The "Sofcast" show is sponsored in whole or part by businesses such as Computer Repair, Inc., "the premier name in repairing high-tech equipment." Commercial messages are delivered in spot advertisements throughout the broadcast. In the future,

"Sofcast," a radio program in Seattle, is more than just a talk show about computers. It may be making history by broadcasting free software to its audience.



At the heart of this novel medium of computing lie Microperipheral's Shuttle Encoder and Communicator.



Midway through his show, Robert E. Lee Hardwick advises the listening audience to ready their equipment for sofcasts.

advertisements may even be tagged to the free electronic information delivered to PCs during the digital broadcast segment.

The show's format falls under the bailiwick of Robert E. Lee Hardwick, a veteran radio announcer of 25 years. Hardwick's articulate voice serves as the common thread tying together the distinct parts of the weekly 30-minute show. At the

The Shuttle Communicator converts the static-sounding sofcast from the radio earphone into a serial stream of binary bits—the primordial language of computers.

microphone, Hardwick interviews guests like Bob Landware, developer of software for synthesizing music on PCs, or he demonstrates computing curios such as the *Ghostbusters* theme played over a Commodore computer speaker.

Sharing announcing responsibilities with Hardwick are Chris Burns and Sally Bronson. Burns reviews industry headlines in a segment called News Bytes, from News Soft News Service. Bronson, the director of user affairs, answers questions from the "user mailbox" on topics ranging from software packages that teach typing to chocolate floppy disks.

By itself, the show's editorial content resembles other productions such as the "Famous Computer Cafe" broadcast on radio stations KIEV and KFOX in Los Angeles and "The Computer Chronicles" televised on public broadcasting stations. What separates Hardwick's show from its counterparts, though, is the transmission of software, or *sofcasts*.

Broadcasting Software

Midway through the show, Hardwick advises the listening audience to ready their equipment for sofcasts. He briefly describes the program or data file to be sent and counts down the sofcast like a rocket launch. A 1-second beep follows, after which the actual software is broadcast. This typically lasts 10 to 12 seconds,

terminated by another 1-second beep. Then Hardwick's voice returns.

To transmit or download software across the air, Hardwick cables a device called a Shuttle Encoder to the serial interface port of his PC. With a program written by Microperipheral, he transfers the file to be sofcast to the Encoder, which converts it to analog signals. These signals can be taped or broadcast directly. Presently, Hardwick tapes his entire show, including the sofcasts, before broadcasting. The show is subsequently played on two AM stations in the Seattle/Tacoma area on Sunday nights, KAMT at 9:30 p.m. and KXA at 9 p.m.

On the receiving end, the audience has an AM radio tuned to the show. Prior to the sofcast, listeners attach a Shuttle Communicator to the radio. A cable coming from the Communicator connects to the radio earphone jack. Another cable connects the battery-powered Communicator with the computer through the serial port.

After the cables between the radio, Communicator, and PC are attached, a special program, also developed by Microperipheral, is executed on the computer. This program operates in a manner similar to a general-purpose communications program such as *PC-TALK*. It accepts a stream of data sent by the Shuttle Communicator to the serial interface and writes the data to a disk file.

The Shuttle Communicator handles the black-box operations of sofcasting. Indeed the Communicator even comes housed in a black box, a 3- by 5-inch unit shaped like an oversized mouse device. It converts the static-sounding sofcast emanating from the radio earphone into a serial stream of binary bits—0s and 1s—the primordial language of computers.

Since the show first went on the air in August 1984, Hardwick has sofcast a plethora of programs. The list includes spreadsheets, flight simulators, picture files, and games aimed at Commodore, Atari, Macintosh, Radio Shack, and IBM PC computers, among others. The public-domain programs distributed through the sofcast were initially received by only a few computers because of the limited availability of Shuttle Communicators. The \$70 Communicators are scheduled for

widespread commercial distributions starting in late March 1985. Meanwhile, Hardwick suggests that users without a Communicator tape the sofcasts. When they later obtain a Communicator, the free software can be captured through the tape recorder earphone jack.

Modemlike Communication

The heart of this novel medium of computing communication lies with the Shuttle Encoder and Communicator. Both devices are patented by Microperipheral. The company licenses the Encoder to radio stations so they can directly transmit software. Alternatively, stations may broadcast Hardwick's show by way of a tape recording or satellite link. Microperipheral has already reached an agreement

Since the show first went on the air in August 1984, Hardwick has sofcast a plethora of programs, including spreadsheets, flight simulators, picture files, and games.

with Learfield Communications of Jefferson City, Missouri, to relay the show via the Westar II satellite. Starting in March, Learfield will sofcast through its 485 affiliate stations to a region covering 750,000 personal computer owners in the Midwest.

To manufacture Shuttle Communicators, Microperipheral will rely on its expertise in developing modems. "The Communicator can be regarded as a type of modem," said Don Stoner, Microperipheral's vice-president of engineering. "It accepts encoded analog pulses and converts them to bits, which are piped to the computer. The bits are assembled into characters by an assembly language program. That program is machine specific; we have a different one for the IBM PC, Macintosh, Commodore, and other computers. The purchaser of the Shuttle Communicator receives the program on a diskette at no extra charge."

Stoner's name is well recognized within the amateur radio community. Twenty-

The Voice of Sofcasting

Robert E. Lee Hardwick, the glib announcer who orchestrates the transmission of software to his radio audience, already has plans to expand and improve his show.

If there's one thing that grabs your attention upon first meeting Bob Hardwick, it's the distinctiveness of his voice. Each tone emanates deep from within the frame of an NFL lineman. The words emerge clear and confident, and the cumulative expression commands respect within a room, over the telephone, or across the spectral frequencies of radio airwaves.

Hardwick's voice has been standard fare over the radio in the Seattle/Tacoma area of Washington state for the past 25 years. While plying his trade from behind a microphone on KVI-AM, Hardwick enamored a large and loyal following with a lively show of news, information, and music, served with a generous helping of Hardwick humor. Central to the production were the antics of Hardwick himself. He has climbed Mt. Kilimanjaro in Africa, dived for sunken treasure in South America, and airlifted toys to children in Alaska after the 1964 earthquake. *Billboard* magazine named him as Radio Personality of the Year in 1978.

Today, Robert E. Lee Hardwick, as he is known on the air, anchors the National Digital Network. His 30-minute "Sofcast" show is broadcast weekly in Seattle and will soon be distributed nationally to a listener area reaching 750,000 personal computer owners. During a regular portion of "Sofcast," Hardwick takes a back seat and relinquishes the microphone to a computer for the direct communication of electronic information to his radio audience.

"I have a reputation for doing things before anyone else does them," Hardwick boasted. "People said, 'You can't broadcast computer data over the radio.' We're showing them otherwise.

"Over the years radio has turned into a mass jukebox. Background music or passive listening is the in thing today. But it's very hard to sell a product with passive listening because you're listening passively. You're not actively involved with what's happening.

"This whole concept we're working on is an active form of listening. It started



Robert E. Lee Hardwick

with a talk show called 'Chipchat' on KVI. Then I teamed up with Microperipheral Corporation and we started broadcasting 'Sofcast' in August."

One of the biggest tasks facing Hardwick and his colleagues is to convince radio stations to air the show. The information age need not exclude radio, but Hardwick says it effectively has. "Sofcast" airs Sunday nights, sandwiched, on one station, between two religious broadcasts, a time when there "is no revenue possibility at all, and hasn't been for 20 years." Yet a computing audience is tuning in, and businesses can reach them through advertising without paying exorbitant rates.

In formatting the weekly radio show, Hardwick aims for a happy medium between the novice and technical connoisseur. His own computing experience

is "extremely limited," and he considers it an asset that he can approach the subject from the realm of the uninitiated. "We don't want to scare the layperson with chiphead talk," he said, stressing the show's populist approach.

Hardwick, affectionately referred to by his colleagues in the broadcasting industry as "The Mouth That Roared," sees sofcasting as a way of counteracting the jukebox syndrome that has captured radio. "The potential for this thing is staggering. For example, when you announce statewide election returns, you just can't list every precinct. Broadcasters don't have time to sit there and read numbers off. Besides, it would put people to sleep. By transmitting electronically through a sofcast, you could deliver an entire state's returns in a matter of 4 or 5 seconds."

Other possible applications include incorporating sofcasting into recordings of popular music. Hardwick mentioned that he has been approached by recording technicians who work with Mick Jagger. Perhaps the lead singer of the Rolling Stones is planning a new format for the group's next album: rock music on one side and a software program that executes a video animation on the color monitor of a PC for the flip side.

The advent of over a dozen computer-oriented broadcasts across the nation, including six television shows, demonstrates that consumers are, in the words of one television executive, "dying for information on how to maximize the investment they have made in a computer." Hoping to satisfy that demand, Hardwick has enlisted the services of an electronic guru. If the sage of Seattle radio has his way, the most talkative host on the airwaves will have the initials PC.—E.J.

five years ago the former schoolteacher suggested launching an amateur radio into space aboard a satellite. At that time, orbiting satellites were closely guarded military secrets. Yet less than 2 years later, in 1961, his proposal became reality. Today satellites ring the globe, echoing transmissions of movies, news, familiar television programs, and innumerable other broadcasts.

"Theoretically, you could sofcast at rates up to 9600 baud," asserted Stoner, who invented the Shuttle Encoder and Communicator. "Unfortunately, most computers couldn't handle it in a one-way mode of communication. So the Encoder and Communicator operate at 4800 baud."

Stoner clarified this point. "You see, personal computers can communicate at 9600 baud, but only in a handshaking protocol. In these situations, if the receiving computer starts falling behind, it tells the transmitting computer to hold up. Then, after it processes the data already sent, it signals for more."

The proponents of sofcasting believe that no-cost advertiser-supported software and electronic information can lead to the mass proliferation of computers.

Since sofcasts are receive-only (there's no way to tell the radio station to stop transmitting), the rate was lowered to 4800 baud, a speed most personal computers can comfortably handle without handshaking. For AM broadcasts, the rate was further decreased to 2400 baud. The slower pace delivers data more reliably in the relatively narrow bandwidths of AM radio. The faster, 4800 baud rate applies only to the wide channels found on FM broadcast bands.

To ensure that the data is received without errors, each file transmitted is surrounded with header and checksum information. The header contains a machine

code (IBM, Apple, Radio Shack, and so on), file length in characters, filename, and file format (text or binary). While receiving a file, the listening software calculates a checksum and compares it to the checksum transmitted by the radio station. If they match, then it assumes that the sofcast occurred without error.

Announcer Hardwick boasted that most sofcasts are received intact. "I want to make it work under the worst possible conditions," he stressed. "Nine o'clock at night, during the winter, over a 1,000-watt AM radio station. If it works there, it'll work anywhere."

Cable Television Link

The problems inherent in AM virtually disappear on FM radio and cable. Music sounds significantly better over FM and television appears crystal clear over cable, and sofcasts accrue similar benefits. In addition to clarity, cable television links open a wide door to other innovative applications of sofcasts.

"We'd like to produce cable simulcasts," emphasized Darland, Micropipheral's president. A simulcast (short for simultaneous broadcast) involves the transmission of a video production on a television channel with its corresponding sound also being carried over an FM frequency. Common applications include musical concerts in which the viewer can watch performers on a television channel and listen to the sound in high fidelity over a designated FM radio station.

"For our simulcasts," Darland explained, "we might give a programming tutorial on television and ship software on an FM band through a Shuttle Communicator. That way users could examine the software on their PCs while the television announcer demonstrates it."

Darland speculated that an FM band on cable television could be dedicated entirely to sofcasts. "Radio frequencies in the air are public property governed by the Federal Communications Commission. It may not be appropriate to fill the air with the hum of computer data. However, FM bands on cable are available for sale or lease. These are perfect for sending reams of data including weather maps, electronic magazines, demonstration software, pixel pictures, and other types of information

that can be accessed through a home computer."

The proponents of sofcasting believe that no-cost advertiser-supported software and electronic information can lead to the mass proliferation of computers in the same way that radio broadcasts of music have made stereo systems standard appliances in the home. Presently, they have amassed a library of 2 megabytes of public-domain software for distribution over the airwaves. Besides games and short utility programs, they intend to deliver interactive fiction, *Multiplan*-style templates, and, in general, any type of digital information that listeners ask for. Two days before the November election, for example, KAMT broadcast a caricature of Ronald Reagan in front of an American flag for Apple Macintosh owners.

Telephone Queries

Although the Shuttle Communicator is used primarily for receiving data, it does have limited capability for two-way communication. In this capacity, it operates like a modem. The cable connecting the Communicator with the radio earphone jack is replaced by a cable that attaches to a standard telephone jack. (The other cable on the Communicator remains plugged into the computer's serial interface.) Characters are received at 1200 or 2400 baud, to be set by the software (the slower rate would be employed for "noisy" telephone lines). Transmission is limited to the keys on a touch-tone telephone. The touch-tone signals are relayed to the computer on the other end of the telephone line. That computer must convert them to a corresponding keyboard character.

Micropipheral has devised a bulletin board-type information service geared to queries by way of a telephone touch pad. For example, you would dial the number of the information service and attach the Shuttle Communicator to the phone line. The computer controlling the service would respond by displaying a list of menu options such as news, user groups, restaurant guide, help, and so on. Then, you can make a selection by pressing the right key on the telephone touch pad.

The developers of this service call it the Shuttle Express and offer it free of charge. It contains information on weather condi-

tions, regional restaurants (categorized by location and type of food), user groups, and classified ads. A subscription system, marketed as the Shuttle Information Service, provides all the benefits of the Shuttle Express plus expanded menus. These

The National Digital Network is just beginning to carve a niche in the land of broadcasting, and, for thousands of PC owners, listening to the radio now has a new meaning.

include four categories of news from the Associated Press (national, international, business, and sports), a steelheader's hotline for trout anglers, and continually updated weather reports detailing the conditions of ski trails, Mt. St. Helens's plume, and National Oceanic and Atmospheric Administration coastal forecasts. These information services can also be accessed with a regular modem configured for 300 baud, 7-bit characters, 1 stop bit, and even parity. The dial-in number is (206) 885-INFO.

Future plans call for the information service to incorporate electronic banking and catalog order functions. It's all part of a grand scheme to link household electronic appliances, namely, radio, television, telephone, and personal computer, with a national distribution system for digital information. Low-cost technology will provide the key to its success. According to Darland, "Where would radio broadcasting be today if KDKA had charged the public to receive its programs?"

The National Digital Network is just beginning to carve a niche in the land of broadcasting, which was previously dominated by talk, music, and television programs. For thousands of PC owners, listening to the radio now has a new meaning. If the softcast trend follows the precedent set by modem/telephone communication, an AM/FM radio may soon become the newest member in the PC's growing family of peripherals.

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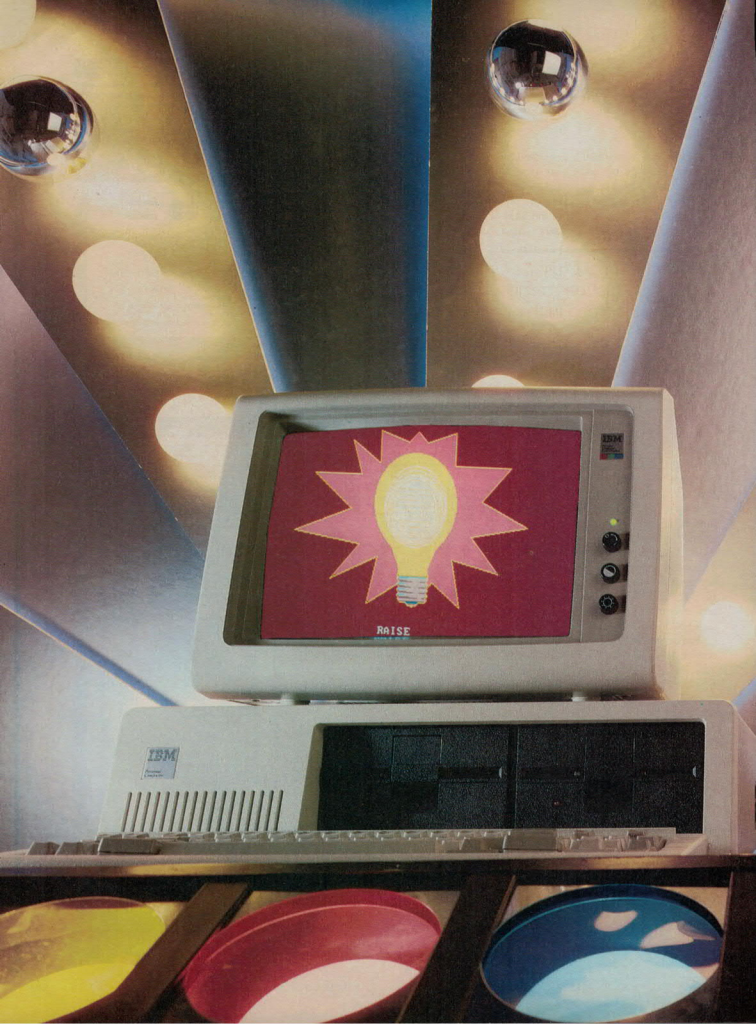
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LUMEN Lights Up Your Room

Two similar programs from Lighting Technologies bring the power of sophisticated lighting design modeling techniques to the PC.

Lighting design is not as simple as it may seem. It requires combining a complex series of numerical calculations with practical considerations. For example, is the room you are reading this article in adequately lit? The answer depends on what the room is used for. The lighting in most rooms is fine for reading the pages of a magazine or jotting down a few notes. If

Photography: Ron Morecraft



LUMEN

that's the case, you've probably never had to consider its lighting design. But, if you plan to use a computer in the room, you might well discover that the lighting is completely inadequate for reading the screen, perhaps obscuring significant portions of it with glare. This inevitably leads to eyestrain, mental and physical fatigue, and, in my case, downright grumpiness.

Good lighting requires the talents and commitment of many people, including interior designers, builders, electrical contractors, lighting consultants, and lighting manufacturers. To help them, the Illuminating Engineering Society (IES) of North America has developed guidelines to meet the task-oriented needs of a building's end user. These guidelines take into account the purpose of a room and the amount and type of close work that will be done there. At one point, IES guidelines were so specific that they distinguished between reading pencil-written materials and photocopies. In the past few years, however, the IES has backed away from insisting on specific criteria and now merely suggests acceptable ranges, leaving the specifics up to the individual designer.

But until recently, there were few number-crunching tools powerful enough to model specific lighting designs on the PC. This meant that lighting designers were often left working in the dark. **LUMEN\$** and **LUMEN-MICRO**, from Lighting Technologies, of Boulder, Colorado, are brightening that situation.

LUMEN\$ and LUMEN-MICRO

The LUMEN programs are a series of lighting design programs that run on the

DO FACT FILE

LUMEN\$ and LUMEN-MICRO

Lighting Technologies
3060 Walnut St., #203
Boulder, CO 80301
(303) 449-5791

List Price: \$495 for **LUMEN\$**, \$2,660 for **LUMEN-MICRO**.

Requires: 192K RAM, two double-sided disk drives or one disk drive and hard disk, Epson-type dot matrix printer with Grafrax, DOS 1.1 or 2.0. Intel 8087 math coprocessor is optional.

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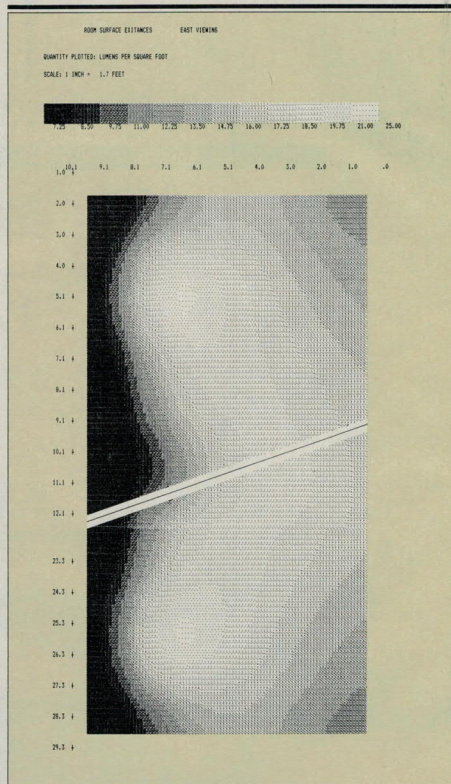


Figure 1: A graphic "picture" created by LUMEN-MICRO of the patterns of light cast on a wall by a particular lighting system. The white areas represent glare.

IBM PC and compatibles. They require a minimum of 192K RAM, two disk drives, and an Epson-type dot matrix printer with Grafrax. Lighting Technologies also recommends the installation of an Intel 8087 math coprocessor to speed up the calculations.

According to Marty McCloskey, director of client services for Lighting Technologies and chairman of the IES Computing Committee, the 8087 can reduce average analysis time by four to ten times. Without the processor, the programs utilize an 8087 software emulator that permits uninterrupted use of the programs. The programs were reviewed without benefit of the 8087 chip and no complications were encountered, but at \$175 uninstalled and \$250 installed, investing in a coprocessor is not out of the question.

Both *LUMENS* and *LUMEN-MICRO* come on multiple diskettes (*LUMENS* has four and *LUMEN-MICRO* has six). You must frequently switch program diskettes during the analysis section of the programs, but provisions have been made for the installation of the programs on hard disks.

The two programs are structured similarly. Each includes a data input program, a photometric database manager, and an analysis program. The major difference is price. *LUMENS* can be purchased for \$495 while *LUMEN-MICRO* runs \$2,660. If my math background still serves me, *LUMEN-MICRO*'s two extra diskettes work out to more than \$1,080 apiece!

The *LUMEN* duo are descendents of a well-known artificial lighting design pair for mainframes: *LUMEN II* and *LUMEN III*, two of the most respected computer-aided lighting-design tools available. These programs were initially available through Computer Sharing Services, Inc. (CSS), a time-sharing service in Denver, Colorado.

David DiLaura, coauthor of the original *LUMEN* and a principal of Lighting Technologies, helped rewrite the mainframe programs to run on a PC. DiLaura, described by one consultant as a "guru" of artificial lighting systems modeling, chairs the IES Calculation Procedures Committee. He is also a practicing lighting engineer and teaches lighting programs at the University of Colorado at Boulder.

How They Work

Specific information is needed to accurately analyze any lighting system. Some of this information will recur from analysis to analysis. For example, troffers (commonly known as fluorescent lights), seem to be the mainstay of lighting design. Whether the design is for a 15 by 15-foot

Lighting design requires combining a complex series of numerical calculations with practical considerations.

office or a 100- by 150-foot production room, the data for each individual troffer, such as power consumption, luminance, and so on, remains constant. To avoid repetitive entry of similar data, *LUMEN-MICRO* and *LUMENS* utilize a photometric database manager. The basic data (photometrics) of the fixture (luminaire) can then be recalled into any lighting system model simply by specifying the luminaire number. *LUMENS* comes complete with a database containing the reference luminaires as described in the *IES Reference Handbook*. The pre-entry of these IES

luminaires allows the designer to begin analyzing systems almost immediately, without having to first enter the photometric data into a completely new database.

Both *LUMENS* and *LUMEN-MICRO* utilize input programs. You enter data for lighting analyses onto an electronic worksheet consisting of a list of specifications followed by blank spaces for data entry. (The PC versions are the first *LUMEN* programs to use worksheets instead of prompts as the mainframe *LUMENS* do.) Worksheets are stored as data input files so that they may be rerun or revised at a later date. Prior to analyzing the system described on the worksheet, the programs check the worksheet for errors and flag them for correction. If you run the programs on a hard disk, you can request multiple analysis with different input files, allowing convenient unattended batch runs.

Editing functions, such as First Page, Line Up, Line Down, Page Up and Page Down, are assigned to the PC's special function keys. The cursor moves from cell to cell, and the programs do not allow placement of data anywhere outside of specified blanks. I was surprised to learn that the numeric pad keys did not control the editing functions, but, after working

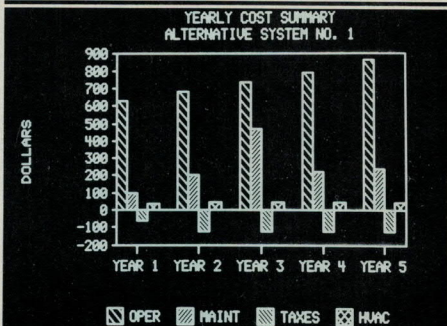


Figure 2: A sample of a file transferred from *LUMENS* to 1-2-3 to take advantage of 1-2-3's graphing capabilities.

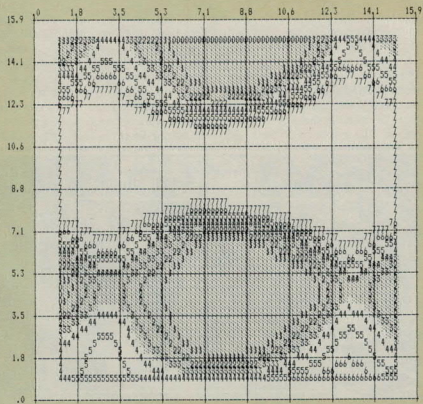
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25,000	2
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35,000	4
40,000	5
45,000	6
50,000	7



This more traditional contour plot indicates the distribution of ESI footcandles (including a quality measurement). The white areas are adequately lit, while the numbered areas designate a range of ESI footcandles surrounding the 35.00 cut-off point. The gray areas are so far below acceptable lighting levels that they have not been given values.

with the program, I came to agree that, since most of the data it deals with are numeric, the pad is better-suited for data entry.

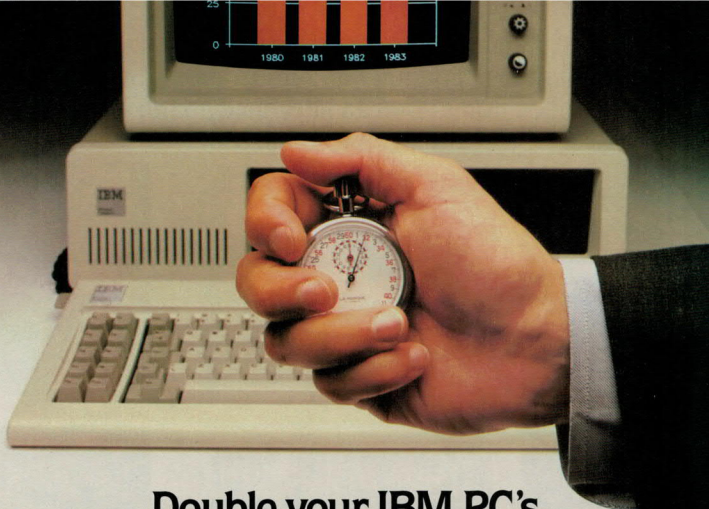
Analysis

From the worksheet, both *LUMENS* and *LUMEN-MICRO* allow you to select the type of analysis to be done and the type of output. Both provide basic measurements of light levels within a room, including zonal cavity horizontal and/or vertical illuminance analyses. They both allow analysis of rectangular, octagonal, and circular rooms.

LUMEN-MICRO can also analyze room lighting conditions by a method known as equivalent spherical illumination (ESI), which was developed by DiLaura and acknowledged by the IES. Traditional analysis methods base calculations primarily on luminance levels. For example, the IES determined that the task of reading typed copy on a sheet of white, flat-finished paper required, let us say, 100 footcandles. A fixture producing 100 footcandles directly above the reading area would satisfy this criteria, even though the glare created by the light source's angle might make reading impossible. ESI adds qualitative analysis to help confirm that not only will an area on the desk have 100 footcandles shining on it but that the light will be thrown at an angle appropriate for the task.

Economic analyses, including initial costs, operating costs, maintenance costs, and depreciation of the system are also available. Lighting systems produce large amounts of heat, which can have a major impact on the heating and air-conditioning in a building. Many buildings now have energy bills running into the thousands of dollars every month, so it's important to provide an analysis of the heating and air-conditioning impact of any present or prospective lighting system.

LUMEN-MICRO's best feature is its output. Using a standard Epson-style dot matrix printer, a designer can create "pictures" of the results of a lighting design. Besides standard contour plots, using numbers to represent light values at locations on a requested geometric plane, *LUMEN-MICRO* will actually simulate what a room surface—a wall, ceiling, or



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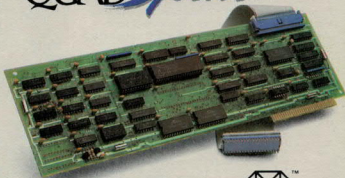
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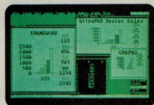
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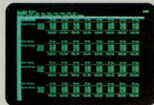
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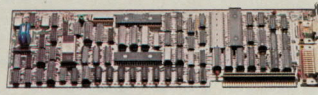
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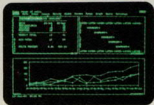
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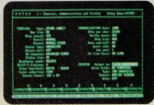
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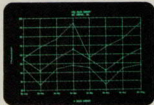
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LUMEN

floor—will look like when lit with a particular system (see Figure 1). Engineers and architects are no longer limited to describing the way the final systems will look in a client's hotel lobby or office building. They can whip out this printout and show the dark and bright spots on any surface in a specified room.

LUMEN-MICRO's best feature is its output. Using a dot matrix printer, a designer can create "pictures" of the results of a lighting system.

Comparatively, LUMEN\$ has a rather sparse output. Analysis results are printed in standard, tabular form. Contour plots or wall simulations are not available. On the other hand, enhanced graphics output, such as depreciation bar graphs, are possible using the data-conversion utility for I-2-3 (see Figure 2).

Because both programs deal primarily with artificial, electrical, interior lighting systems, daylighting (use of sunlight in lighting system designs) is not an option, according to DiLaura. This, he says, is mainly owing to lack of present standards and the minimum of daylight use in the majority of lighting designs.

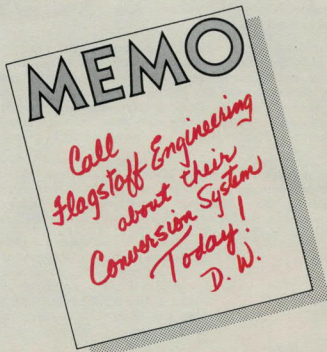
LUMEN\$ and LUMEN-MICRO are tools written for experienced engineers, architects, and manufacturers. The brief documentation covers the simple processes of program operation. It does not teach the skills required to design lighting systems, but rather, tries to help experienced designers produce effective systems.

Whether LUMEN-MICRO or LUMEN\$ is right for you depends upon your budget and your analysis needs. LUMEN-MICRO offers a complete array of analysis options plus some spiffy plotting. But if its price tag is too high, LUMEN\$ is an economical way to acquire basic zonal cavity and economic analysis capabilities.

With a track record in the time-sharing field, LUMEN is already an established name in the lighting-design community. In addition, the PC versions are easy to learn and use. Lighting Technologies suggests

that designers fill out the worksheets on hard copy and allow other office personnel to do the actual data entry and run the analysis. Now, skilled professionals can utilize their talents—in this case, the ability to

design useful, task-oriented, and energy-conscious lighting systems—and leave the tedious, methodic calculations to something that probably has nothing better to do anyway: their PC. ■



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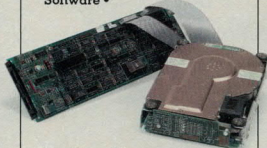
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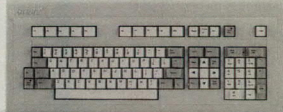
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THE SKY'S THE LIMIT

TellStar and Journey to the Stars allow amateur astronomers to create the scaled-down equivalent of a huge planetarium projector on their computer screen.

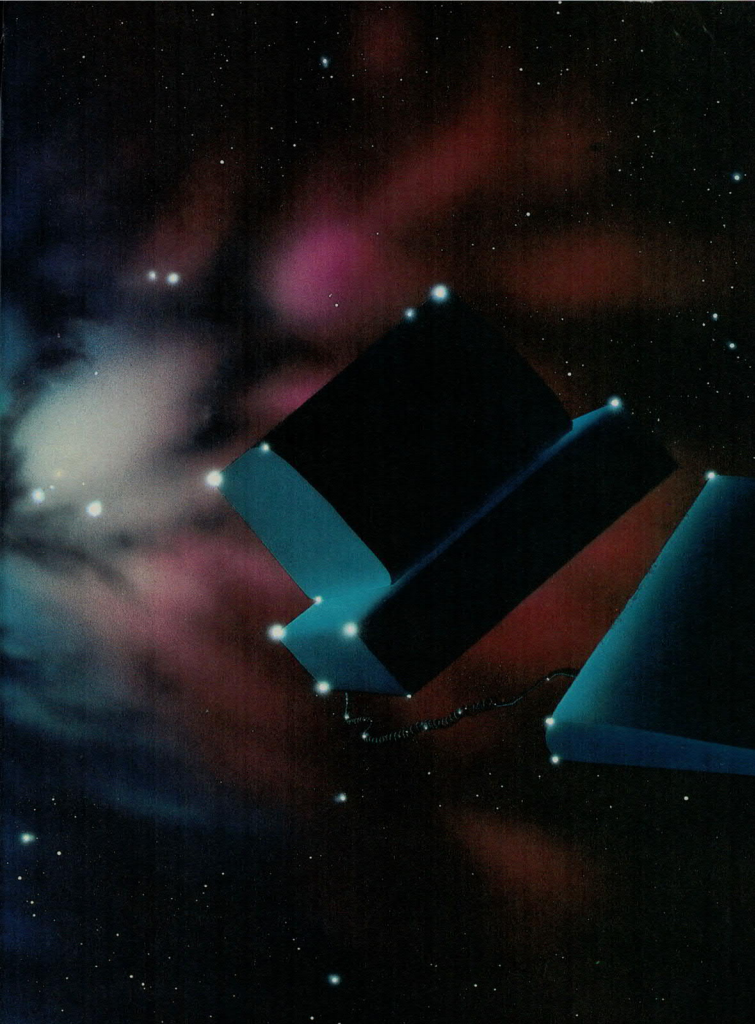
Ever since I met the big Zeiss planetarium projector at Chicago's Adler Planetarium, the power of the planetarium concept has fascinated me. It's a time machine with its eye turned skyward: A few taps at the controls and you can see the night skies as they looked the day you were born—or the day Christ was born. Tap another command, and the stars appear as you might see them in the daytime if the sun could be dimmed to a faint ruddy disk.

The Zeiss planetarium projectors were originally analog computers, relying on

Illustration: Kim Poor



P
1985



THE SKY'S THE LIMIT

a combination of mechanical setting circles and precision motors to perform their magic. Like everything else, planetariums have recently gone digital. Most projectors are now controlled by computers, typically DEC PDP-8 or PDP-11 machines. No precision motor can calculate as accurately (or as fast) as a good floating-point math package.

It should come as no surprise that you can work some of that planetarium magic in your living room on the screen of your PC's monitor. *TellStar* from Spectrum HoloByte, Inc., and *Journey to the Stars* from Compress, are two new astronomy programs that can give you a taste of that magic. I had originally intended to compare the two, but they turned out to be so different in their approaches as to be nearly complementary.

TellStar: The Software Ephemeris

TellStar has been around for several years for the Apple II and has recently been converted for the IBM PC. It has several uses, but it functions best as a fast and very accurate software ephemeris.

An ephemeris is a table of values to be used in calculating the positions of the sun, moon, planets, and planetary satellites at a given time and from a given place on Earth. The U.S. Naval Observatory publishes an ephemeris each year called *The*



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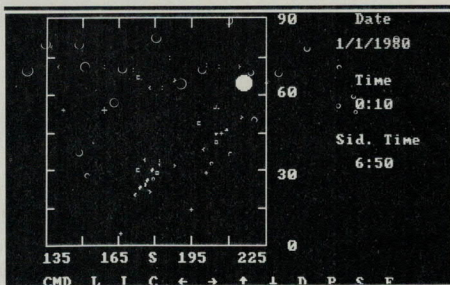
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Although *TellStar*'s star display is relatively sparse, the stars have been chosen to give good outlines of the major constellations.

Astronomical Almanac. Inexpensive and a superb-quality hardback book, *The Astronomical Almanac* is really just a collection of data; to find an object with its help requires a certain amount of work on your part, and occasionally some frightening calculations.

While not as complete as *The Astronomical Almanac*, *TellStar* does all the work, as a good computer program should. Basically, you tell *TellStar* where you are and when, and zap. *TellStar* shows you what's out there.

TellStar has tables for the sun, the moon, and all nine planets in the solar system. It can display 247 of the brightest stars and all 110 Messier objects (a collection of the brightest star clusters, nebulae, and galaxies). It can show you the stars for any Earth location at any time all the way back to the year A.D. 0 and on into the future up to the year 3000. (To its credit, the program warns that its greatest accuracy lies in the 1980 to 2000 range. Knowing how these calculations work, I would say that any date before 1600 or after A.D. 2400 would be so distorted by cumulative inaccuracies as to be misleading.)

Setting up TellStar

TellStar originated in the garage days of microcomputer software, which in this case means sparse, technically oriented documentation and severe, no-nonsense,

command-driven screens. Its 72-page reference manual is daisywheel-printed and contains no illustrations. It has no index, and at least half of it consists of tables of star and Messier object positions.

The upshot is that you must read the entire manual carefully before you attempt to install or run *TellStar*. The software, while competently designed, is not self-explanatory.

TellStar's greatest drawback is that it is copy protected, and there is no provision for backup copies. Spectrum HoloByte will replace a defective diskette within 10 days of purchase; thereafter, the company will replace defective disks for \$20, at its option, if you return the original disk. This means that the company expects you to run the distribution diskette on a day-to-day basis, which I consider pure madness for anything but video games. Worse, the copy of *TellStar* I received for review would not work reliably on my system. About half the time I ran it, I got read errors that brought the program down. It worked reliably only after I used *Copy II-PC* to move the program (in admitted violation of the license agreement) to one of my own disks.

TellStar's disk maintains a "standard" location for observing. Generally you enter the latitude and longitude of your own location. To help you, the manual's appendix holds a table of the coordinates

of about 100 major cities. Although Rochester, where I live, is not among them, I found its coordinates in the Encyclopedia Britannica. Many American atlases and gazetteers also contain the latitudes and longitudes of American cities.

You must also enter the time of observation. When booting, *TellStar* reads your system clock and asks if you wish to use that time in calculating the positions of the stars and planets. Alternatively, you can enter any date and time you like. One caution—enter the entire year, including the century! The first time through I typed in 84 for the year—and I got the sky for the year A.D. 84.

Putting the Skies on the Screen

TellStar must recalculate the positions for about 260 different objects each time you change either the observing location or the observing time. On an IBM PC, the calculations take a minimum of about 90 seconds. The further away from the current date you go, the longer it takes—up to several minutes for A.D. 84.

The program courteously indicates the progress of its calculations by printing periods across the screen as it goes. This reassures nervous types that the machine has not slipped a bit and gone off into the fifth dimension.

Once the calculations are complete, you have two choices: display a simulation of the sky or use the calculated positions for further calculations.

Casual observers will almost always choose the display. *TellStar* can display nine views of the heavens, one looking toward each of the eight major points of the compass and one looking toward the zenith. The PC's cursor control keys move you instantly from one to another.

Stars are represented by points or crosses, planets by small white disks (except for Saturn, which is a small white disk with rings), the sun by a larger magenta disk, and the moon by a white disk that displays the current phase.

The star display in *TellStar* is relatively sparse. Two hundred forty-seven stars aren't really that many, and they have been chosen to give good outlines of the major constellations. All of the zodiac appears on screen the better to orient you for spotting the fainter planets. Away from the

zodiac, displayed stars thin out considerably.

This is not altogether a bad thing, considering the small area of screen available for plotting stars. The PC's graphics screen is a fairly coarse medium for dis-

All of the zodiac
appears on-screen, the
better to orient you
for spotting the
fainter planets. Away
from the zodiac,
displayed stars thin out.

playing hundreds of tiny objects. Raising the total to about 350 stars would add significantly to *TellStar*'s usefulness, but any more than that would crowd the screen.

Somewhere West of Zubenelgenubi

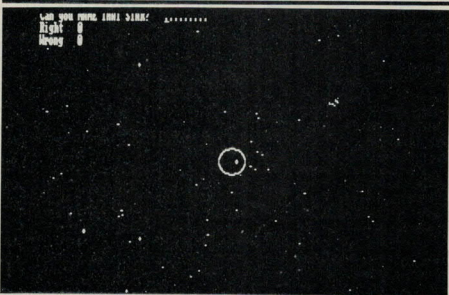
TellStar displays a number of commands at the bottom of the screen. By far the most interesting is the I (identify) command. Pressing the I key brings up a small crosshair cursor on the screen. The cursor control keys move the crosshair around the star field. When you have the crosshair centered over an object and press the space bar, the program identifies the object by

name and gives its magnitude, rise and set times, and its position in equatorial coordinates (right ascension and declination) and horizontal or altazimuth coordinates (heading and elevation.)

This feature is absolutely necessary for telling the planets from Messier objects. It is less useful for the stars for the curious reason that it gives the stars' ancient (usually Arabic) names rather than using the modern astronomical nomenclature that consists of the constellation in which the star appears plus a numeric or Greek letter identifier. For example, I placed the crosshair on Alpha Librae and was told I had chosen Zubenelgenubi. Moving over to Beta Librae, I found that *TellStar* knew it only as Zubeneschemali. None of my friends had ever heard of Zubenelgenubi, though they guessed that it may have been where Obiwan Kenobi came from.

All humor aside, this is a serious deficiency. *TellStar*'s identify function works the other way as well; if you type in "Zubenelgenubi" after the L (Locate) command, *TellStar* places a flashing crosshair over Alpha Librae. If you type "Alpha Librae" instead, *TellStar* insists that no such object is in its tables.

Glancing through the appendices, I noted that the vast majority of the stars in *TellStar*'s tables were named things like Unuk, Wasat, Rutilicus, Alkaluropsis, and



Journey to the Stars drills you by playing Name That Star. Unfortunately, you have to type in the star's ancient name rather than its modern designation.

THE SKY'S THE LIMIT

Zosma, without even a paper cross-reference to their more familiar names. While Zubenelgenubi is a whacky and romantic thing to call a star, it is not what 99.44 percent of amateur astronomers call Alpha Librae. So at least as far as stars are concerned, *TellStar*'s identify function is of little practical use.

Looking for Mercury

On the other hand, *TellStar* really shines when looking for planets. Finding Mercury in the sky is an unholy hassle, especially in a city where your horizon is dirty and cluttered. Mercury, while a fairly bright planet, is always close to the sun and never in an especially dark sky. Finding it is rough unless you know exactly where to look.

I knew that Mercury is a morning star for the first half of January. I also knew that, where I live, the sun rises about 7:15 a.m. at this time of year. So I requested a display of the southeastern sky at 7 a.m., and there was Mercury, just a bit east of Antares, in Scorpius. The display showed it fairly close to the horizon but quite bright, and it gave me a good idea where to look based on the position of familiar constellations.

On a cold January morning I hopped into my car in search of a flat horizon. Looking southeast over a nearby cornfield, I saw against pink dawn light a bright star to one side of Antares. It was no longer anything like night, and all but the brightest of the real stars were dimming out. Had I gone earlier for darkness, Mercury would have been hidden by trees along the horizon. Since *TellStar* told me where to look, I could find it even in a mottled and pinkish sky.

The TellStar Utilities

In addition to its display function, *TellStar* performs a number of nondisplay functions using the star and planet tables. It can give you the position, magnitude, and rise and set times for any solar system object without having to calculate positions for all 247 stars. Another *TellStar* utility converts equatorial to altazimuth coordinates and back again. A more arcane utility provides precision adjustments from epoch 1950 coordinate tables to current coordinates. This allows you to

use charts and star catalogs drawn up for epoch 1950 to find objects not included in *TellStar*'s tables. The Earth's equatorial wobble renders star charts inaccurate over a period of years, but tables are generally issued for "epochs" only every 50 years. You can either do the interpolation yourself on paper or let *TellStar* do it—I'm for the computer every time.

TellStar can also convert between ecliptic and equatorial coordinates. Eclip-

Tellstar really shines when
looking for planets.
Finding Mercury is an
unholy hassle, especially
in a city where your
horizon is dirty and
cluttered.

tic coordinates view the universe from the sun's perspective rather than the Earth's. You're unlikely to use them unless you are very deep into your astronomy.

A Lighter Journey to the Stars

For all that *TellStar* can do, it expects a fair amount of sophistication from its users. It shows and it tells; it does not explain. With some delight, I can report that *Journey to the Stars* can do what *TellStar* can't: teach you a little bit about the stars and the constellations. It has a table of 1,400 stars, and it displays them on your computer's screen. It does not deal at all with the sun, moon, or planets, nor does it offer rise times, set times, or coordinates for the stars.

What *Journey* excels at is teaching. *Journey* can take a beginning observer and explain the fundamental concepts governing the apparent motions of the stars from the Earth. It teaches the names of the stars and the constellations and how to find them in the skies.

To install *Journey to the Stars*, you must run a program that enables or disables color (for using a monochrome monitor) and enables or disables sound. The sound is used only to accompany the pointer for the Find That Star drill. It is amusing the first few times you hear it, but I was very glad I could turn it off.

Unlike virtually every other educational program I have reviewed, *Journey* includes a tutorial program, *JSTUTOR*, that teaches you how to use the *Journey to the Stars* program itself, explaining its commands and the various courses (called "journeys") it offers. Once you run *JSTUTOR*, you don't need to flip through the manual very much. *JSTUTOR* is beautifully designed and can be appreciated by fairly young children. I would not hesitate at all to put it in the hands of a bright 8-year-old.

You run the main program by typing *JSTARS*. It is divided into ten journeys, each of which is a mini-course in some aspect of backyard astronomy. Journey 1 is *JSTUTOR*, which may be run from within *Journey*'s main menu. Journeys 2 and 3 are the real meat of the program: Constellations and Bright Stars. Journeys 4 and 5 present the stars for the northern and southern hemispheres. Journeys 6 through 9 present the stars as they change through the four seasons, winter, spring, summer, and fall. Journey 10 explains how to locate stars and constellations through the use of right ascension and declination coordinates.

No Lines

I remember being very young and taking my copy of *The Golden Book of Astronomy* out in the backyard and trying to find Leo the Lion. Unlike the crisp charts in the book, the skies showed no helpful lines between the stars. I was able to find Leo after awhile, but I kept wishing that God would just turn on the lines for a few seconds so I could get my bearings; after that I would gladly muddle through on my own.

Journey to the Stars has 48 constellations in its tables. These are only about half of the constellations actually in the sky, but many constellations are so faint that they contain no recognizable patterns. All of the bright and easy constellations are here, including the 12 constellations of the zodiac.

You can display any of these 48 constellations on the screen. No lines connect the stars, but if you cannot bring yourself to see the water snake in Hydra (I confess that one escapes me as well), pressing the Enter key projects a bare-bones outline of

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the major figure between the stars. This is easy enough for water snakes, but the representation of Libra suggests nothing of scales, and the Big Bear seems more a collapsed cubistic *Pac-Man*.

Journey also includes a drill/game called Name That Constellation. The program picks a constellation at random and displays it without lines. You try to recognize the pattern on your own and type the name into the screen. The program keeps track of how many you've gotten correct, and when you get one wrong it jogs your memory by drawing the telltale lines between the stars and telling you the correct name.

Curses, Zubenelgenubi Again!

The Bright Stars journey shows you how to find 42 of the brightest stars. If you choose, it will then drill you by playing Name That Star. *Journey* draws a circle around a star on a starfield (no constellation lines to help here), and you must enter the name of the star.

Unfortunately, Name That Star has a familiar problem: you have to type in the star's ancient name. The Arabs said Alnilam; I say Epsilon Orionis; *Journey* expects Anilam. Much to its credit, *Journey* always gives the modern designation alongside a star's ancient name; but when push comes to shove and the drill starts, it accepts only the ancient name.

You can also find that star when displaying the seasonal star charts. For this drill, *Journey* cheerily commands, "Find Cursa!" You then steer a little pointer (called a UFO—argh!) over to Cursa with the arrow keys and press the Ins key to register your choice. If you have never heard of Cursa (join the club—it is not one of the 42 brightest stars from the previous drill), *Journey* moves the pointer to the proper position and corrects you: "Sorry, you picked Zaurac. Here is Cursa."

I scored badly in this drill, having been asked to locate stars with names such as Albena, Kochab, and Shedir. Finally I was told, "Locate Zubenelschemali!" I figured, no problem—but when I moved the UFO confidently to the furthest corner of the screen, I was scolded: "Sorry, you picked Zubenelgenubi. Here is Zubenelschemali."

I'll get it right one of these days.

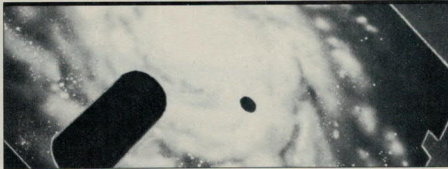
Complaints

Considering what passes for software these days, both of these programs get very high marks. Both are remarkably bug-free. At one point, *TellStar* scrolls up the entire graphics screen one line after you enter a text response, which loses part of the star display off the top of the screen. *Journey* looks completely clean.

My worst complaint against both programs focuses on their emphasis on

South America) I would, however, gladly suffer a reasonable increase in processing time in exchange for a more sophisticated projection that would eliminate much of this distortion.

Journey to the Stars has an overrigid command structure. Once you begin playing Find That Star, you have only two options: continue playing or exit the display to the main menu. Furthermore, once you move the view with the arrow keys



ancient names. I built my first telescope at 13 and have a pretty good working knowledge of the skies, but it does not and will not include memorizing hordes of quaint and bizarre names such as Cursa, Zaurac, and Zubenelgenubi. There is a systematic and universally used designation system for the two or three thousand brightest stars. It uses the generic form of the constellation that contains the star and a Greek letter that roughly indicates its magnitude rank within the constellation. Thus, Alpha Orionis is the brightest star in Orion, and so on. For fainter stars, ordinary numbers are used, and the ranking is according to increasing right ascension. Almost everyone uses this system.

To best serve amateur astronomers and other students of the skies, both programs should recognize both the ancient and modern naming systems. I know that it can be done, and I hope that both programs will incorporate the necessary changes in future releases.

TellStar's sky displays are needlessly small and plagued by an irritating distortion toward the top of the screen. Any time a spherical area is displayed on a plane, there tends to be some distortion, but using a mapmaker trick or two can minimize this. *TellStar*'s projections are Mercator-style (you know, like those world maps in which Greenland appears as large as all of

from the standard seasonal view, you can no longer play Find That Star. This may be a bug or it may be a feature, but whatever the intention, it would be easy to avoid and should be changed.

However, that's about where it ends. What's most important to emphasize is that these programs are fun. If you are already an amateur astronomer, *Journey to the Stars* will be old hat, but *TellStar* will become absolutely indispensable for planning planetary observation and photography. *TellStar* also provides a tremendous bonus for astronomers who own a Dobsonian telescope: It gives, for all objects, altazimuth positions (heading and elevation), which are the only kind of coordinates a Dobsonian mounting understands. Odyssey owners, rejoice! Dial-and-find astronomy is within your grasp!

If you are curious about the stars but never took time to learn the lore of the skies, *Journey to the Stars* is an inexpensive and enjoyable way to start. Much more than *TellStar*, *Journey* encourages you to "poke around" without making you feel as if you're in way over your head.

And pretty soon, having mastered *Journey to the Stars*, you'll be out there under the sky pulling on Leo's tail.

Faster, in fact, than you can say "Zubenelgenubi!" ■

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Command lines	47	244
Keystrokes	434	6588
Time*	9 minutes	2 hours

*Actual time may vary depending upon skill level.

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HEAVYWEIGHT FEATURES		
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Comprehensive Procedural Language:	Yes	Yes
Report Writing Features:		
(A) Access to System Date and Time:	Yes	No
(B) Choice of Column or Row Format:	Yes	No
(C) Accessible Tables:	40	10
Password Security:	Yes	No
User-Definable Data Entry Rules:	Yes	No
Automatic Key Index Maintenance:	Yes	No
Data Dictionary:	Yes	No
Number of Relational Operators:	6	2

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	R:BASE 5000	dBASE III
Application Express System:	Yes	No
Application Compiler ¹ :	Yes	No
Can Directly Access Program Files From:	Lotus 1-2-3 pfs:file R:base 4000 dBASE II	dBASE II
Pre-Defined Macros:	Yes	Yes

A COMPLETE SET OF OPTIONS

	R:BASE 5000	dBASE III
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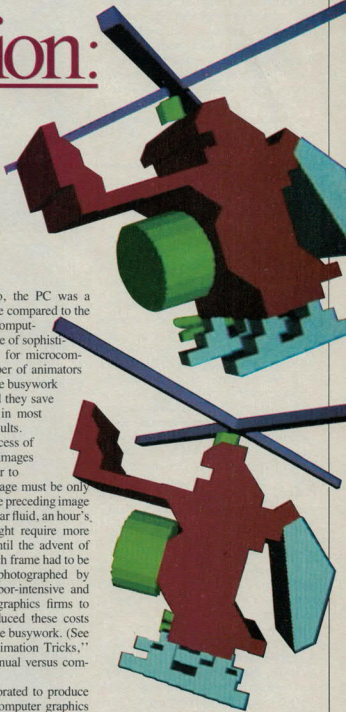
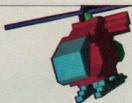
PC Animation: A Dream Come True

This resourceful animator has taken advantage of innovative graphics software to turn his PC into a useful animation tool and reduce the trade-off between cost and effects.

Not too long ago, the PC was a graphics illiterate compared to the powerful supercomputers. But with the advance of sophisticated graphics software for microcomputers, a growing number of animators are using the PC to do the busywork of animation. In the end they save time and money, and, in most cases, produce good results.

Animation is the process of creating a sequence of images and making them appear to move. Because each image must be only slightly different from the preceding image for the animation to appear fluid, an hour's worth of animation might require more than 80,000 frames. Until the advent of computer animation, each frame had to be drawn, colored, and photographed by hand, a process too labor-intensive and costly for most small graphics firms to consider. PCs have reduced these costs considerably by doing the busywork. (See sidebar, "A Bag of Animation Tricks," for a comparison of manual versus computer animation.)

My PC and I collaborated to produce two striking animated computer graphics sequences. The first graphics sequence shows a colorful toy helicopter flying around in a circle. I used 32 images of the copter to show it buzzing in flight, and it takes 50 seconds to render the sequence on



screen (see Figure 1). The other sequence illustrates a walk through a "wireframe" supermarket. I had to use 513 images for the supermarket sequence to illustrate just a one-quarter turn around the market. The wireframe supermarket (with 128 wireframe images) takes 10 minutes to render (see Figure 2). A full sweep of the supermarket would require nearly 100 hours of computation time, which would be prohibitively expensive. For both sequences, I used a combination of Cubicomp's CS-5 Graphics System (Cubicomp has since

Until the advent of computer animation, each frame had to be drawn, colored, and photographed by hand.

updated this system and changed its name to Polycad/10) and the *Lumena* paint program from Time Arts Computer Graphics of Santa Rosa, California.

These two sequences typify some of the computer animator's dilemmas. The more images you generate to create a sequence, the more fluid the motion appears. But to achieve more motion you need more computing time, memory, and storage, and the display complexities and the overall costs soar. I am constantly looking for new hardware/software combinations that will reduce the expense and improve the effect of animation.

The Illusion of Movement

Computer graphics animators have three hurdles: They must *create* the sequence, *display* it, and, finally, *present* the sequence by transposing it to another medium.

The simplest way to create animated sequences on the PC is to use BASIC. For example, you can draw a circle, store it, and recreate the same circle at a slightly shifted location. By performing the same step over and over, you create a sequence of circles. Displayed quickly enough, these images give the illusion of movement.

Graphics software packages also sim-

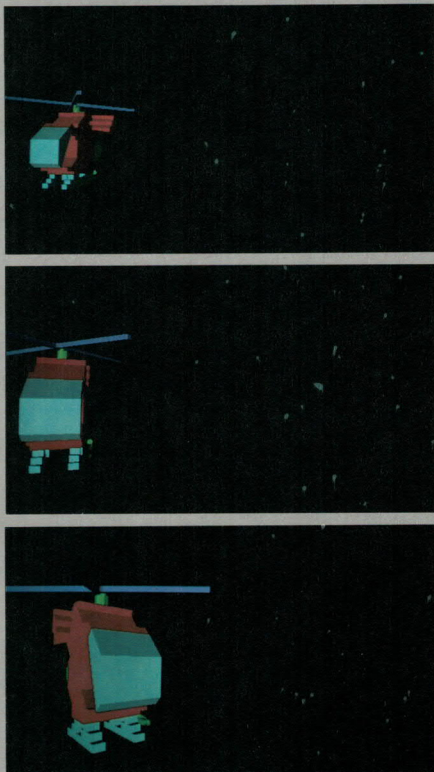


Figure 1: Three of the 32 images necessary to show a toy copter in flight.

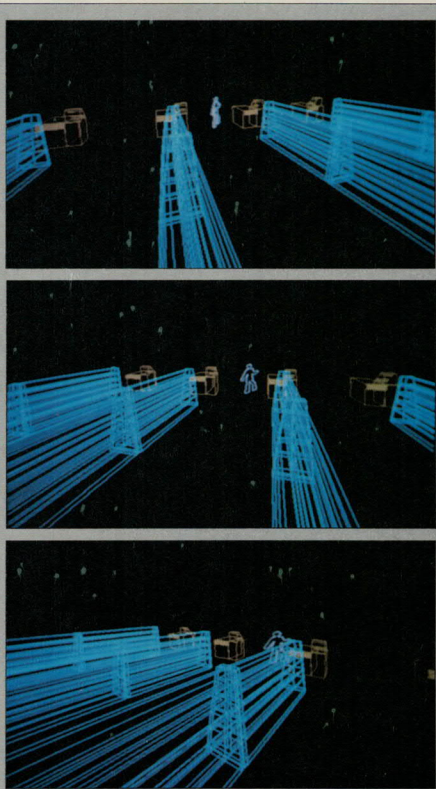


Figure 2: To render a one-quarter turn around the market, the PC created 513 images.

ply the task by giving a set of primitive commands that make the creation process easy to understand and learn. These commands allow you to "paint" as if you were working frehand, or they let you "draw" by creating a composite of simple objects with menu selections.

These software packages give you a new degree of animation freedom. Whether you're using BASIC or a sophisticated drawing system, you are able to string individual screens together to simulate movement. This type of animation has been coined "clunker" animation by the industry because of the "clunk" that a single slide makes as it is plopped into the slot of a projector. It reflects the one-by-one, "single-cell" nature of this type of animation. Clunker animation, which is the basis for most cartoons, becomes increasingly sophisticated as you add more color and elements and as the speed of "clunking" increases.

A "build" is another technique that is well suited to computer graphics because it successively adds images as overlays to the original image to give the effect of movement.

Clunker animation and builds both require you to draw, or render, each component of the image. This process drives

As a computer animator, the more images you generate, the more fluid the motion appears. But then you need more computing time, memory, and storage, and the overall costs soar.

animators to drink and companies to take shortcuts to save the expense of having an artist render endless sequences of animation. If you watch the Saturday morning cartoons, you'll see that too few images in an animation sequence produce stilted, jerky animation. PC-based graphics software reduces the amount of single-cell rendering necessary.

In addition to their drawing propensities, many packages have facilities to

move objects across the screen. Prentice-Hall's *ExecuVision*, for instance, lets you move images around once you've created them on the screen. You proceed by selecting a word in your title, selecting its ultimate destination on the screen, and using the MOVE command to step the object across the screen. Each time you show that particular image, the movement is automatically repeated.

The Lenipen Graphics System from Duncan-Atwell Computerized Technologies lets you manipulate a series of PC-rendered drawings against a background series. You specify the desired path across the screen with a light pen or mouse, choose the duration of the movement, the duration of the display, and the number of times to repeat (or loop) the sequence. Running the sequence gives you instant animation.

Painting Without a Brush

Sophisticated paint programs such as *Lumena* offer a variety of animation capabilities. You can use a stylus or a digitizing pen to enter a hand-lettered logo into the system. You can then create a marvelous animated effect by making the letters change or by cycling through a sequence of different colors.

If you follow my example and connect the CS-5 Graphics System to *Lumena*, you obtain two graphics tricks: three-dimensional imagery and buffering. CS-5 lets you create a three-dimensional image, antialias it, shade it, and then use *Lumena*'s painting capabilities to create some nifty final touches. (Antialiasing is a computer technique that tricks the eye into believing that a jagged line is smooth by varying the pixel intensity. It is particularly effective on diagonal lines.)

CS-5's display buffer lets you hold an image created on the system in a buffer while you work on another; the buffer can also send the image to a monitor. The Cubicomp add-on has two display buffers and can simultaneously store two separate 512-by-512-pixel images, each composed of up to 2,000 polygons. You can put one image in the first buffer and have a closely aligned image in the second. Switching buffers while sending their contents out to the display monitor gives the illusion of motion.

Artwork, by West End Film, is a solid modeling package that gives the animator a complete menu-driven system for creating three-dimensional animation. *Artwork* includes Draw, which is utilized for line-drawing solid models; Animate, which manipulates the models created in Draw; and Meta, which blends one image into

FACT FILE

Artwork

West End Film, Inc.
2121 Newport Pl., NW
Washington, DC 20037
(202) 331-8078

List Price: \$950-\$2,450, depending on graphics card used

Requires: 256K RAM, two disk drives.

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DataCam 35

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Webster, NY 14580-0338
(716) 265-1600

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Dr. HALO

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Takoma Park, MD 20912
(301) 270-0240

List Price: \$99.95

Requires: 256K RAM, graphics board.

CIRCLE 679 ON READER SERVICE CARD

ExecuVision

Prentice-Hall, Inc.
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Old Tappan, NJ 07675
(800) 624-0023

List Price: \$395

Requires: 128K RAM for DOS 1.1, 256K RAM for DOS 2.0; two disk drives.

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CIRCLE 677 ON READER SERVICE CARD

Lenipen Graphics System

Duncan-Atwell Computerized Technologies, Inc.
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Hillside, NJ 07205
(201) 355-1690

List Price: \$695

Requires: 256K RAM (320K recommended), mouse or digitizing pad (optional).

CIRCLE 676 ON READER SERVICE CARD

Lumena

Time Arts Computer Graphics
3436 Mendocino Ave.
Santa Rosa, CA 95401
(707) 576-7722

List Price: \$7,500

Requires: 256K RAM, hard disk, DOS 2.x.

CIRCLE 675 ON READER SERVICE CARD

Matrix QCR

Matrix Instruments, Inc.
1 Ramland Rd.
Orangeburg, NY 10962
(914) 365-0190

List Price: \$21,300

Requires: Graphics software and driver.

CIRCLE 674 ON READER SERVICE CARD

PC-EYE

Chorus Data Systems, Inc.
6 Continental Blvd., Box 370
Merrimack, NH 03054
(603) 424-2900

List Price: 4-bit, \$495; 6-bit, \$600; 8-bit, \$1,495

Requires: IBM PC-XT, video camera.

CIRCLE 673 ON READER SERVICE CARD

another in precisely specified amounts. For instance, you could draw a Neanderthal head and the head of a modern man, then use Meta to transform one into the other.

Animate manipulates the solid models created in *Artwork* with an on-screen menu that controls the directions, velocities, and durations of the sequences. You can quickly "pencil-test" the movements in an on-screen window before you execute the final animation. (Traditional pencil testing involves photocopying the drawings onto acetate overlays and filming them in order to preview the effect of the animation.)

Video digitizing is another useful technique that allows you to enter a drawing, photo, film, or video frame into the computer via a digital device. For example, using PC-EYE, a video capture board

from Chorus Data Systems, with the IBM Color Graphics Card, I was able to create a rock video with four-color animation by digitizing and painting individual frames of a videotape. PC-EYE allowed me to adorn my videotape with swirls of psychedelic color.

PC-EYE can handle input from video cameras, TV, and single black-and-white images. You can work with gray scales or with varying levels of colors, depending on which graphics card you install in the PC. I experimented with the four-color IBM Color Graphics Board and the fabulous Revolution color board from Number Nine Computer Corporation.

If you've ever watched Cable News Network, you've seen live frozen-frame shots of the newscasters that suddenly rotate on a plane and zoom off into space. Under normal circumstances, this effect would be expensive and involve a lot of equipment. You can, however, create the same effect with the combination of PC-EYE, the *Dr. HALO* paint program from Media Cybernetics, and either the IBM or Number Nine color board. After capturing the image with PC-EYE, you can use *Dr. HALO* to paint the image electronically and then trim, copy, and rotate the photograph. Finally, you use *Dr. HALO's* animation movement to zoom the photo off into space.

Me and My Cubicomp

The CS-5 Graphics System has become the backbone of my animation experiments. I use it to create most of my solid modeling sequences. The system lets me create two- or three-dimensional images and display them as line drawings or antialiased line drawings and in flat- or smooth-rendered fashion. I can scale and rotate my images in space, create elaborate shading effects, and evoke command sequences to rotate or move the images on the screen. CS-5 can automatically step a camera shutter and advance the film, frame by frame. The package operates in either a menu- or command-driven environment.

If I create a cube using CS-5, I can rotate it on the screen using the cursor keys. Each time I press a cursor key, the rotation continues. It takes 32 presses to complete a cube rotation. By changing the

velocity of the spin, I can designate 512 key presses to complete a cycle. Moreover, by stringing powerful macro commands together, I can eliminate the need to sit and press keys. Here's how I sequence the rotation of a cube in a command-driven environment: (1) rotate the cube x number of degrees; (2) compute the new image to the back buffer; (3) when fully rendered, switch the image to the front buffer and display it; and (4) go back to step 1. Repeat 32 times.

If the sequence and rendering times are short, you can use a PC to display your works. Both *ExecuVision* and Lenipen use "slide presentation" utilities to present successive stored images. These images can be displayed at several speeds and in an endless loop.

The CS-5 Graphics System's sequential menu-driven animations and command macros and *Artwork's* Animate motion control menus allow you to display more fluid animations. Time Arts Computer Graphics promises that revised versions of *Lumena* will have more buffering

Video digitizing is a technique that allows you to enter a drawing, photo, film, or video frame into the computer via a digital device.

capabilities. Cubicomp also promises an enhanced package with menu-driven three-dimensional paths, key frame interpolation, preview, and velocity profile specification. Therefore, real-time animation displays on the PC screen may soon be affordable realities.

Obviously, you don't want to lug \$20,000 of heavy computer equipment each time you give a presentation. You want to get your presentation out of the computer and put it onto some transportable medium to display it.

With CS-5 you can bypass the computer storage entirely. The CS-5 software steps the camera through the following sequence and records it frame by frame: (1) rotate the cube $\frac{1}{32}$ of the way around; (2) render the cube; (3) turn on the camera

Polycad/10

(formerly known as the CS-5 Graphics System)

Cubicomp Corp.
3165 Adeline St.
Berkeley, CA 94703
(415) 540-5733

List Price: Polycad/10, \$11,900;
Polycad/10V, \$13,900

Requires: 512K RAM, high-resolution monitor.

CIRCLE 672 ON READER SERVICE CARD

Revolution

Number Nine Computer Corp.
691 Concord Ave.
Cambridge, MA 02138
(617) 492-0999

List Price: \$1,745

Requires: 128K RAM, analog RGB monitor.

CIRCLE 671 ON READER SERVICE CARD

or videotape machine and put the image on x number of frames; and (4) stop the camera or videotape, go back to step 1, and repeat 32 times.

A Less Expensive Approach

The least expensive and most common—though much maligned—approach for getting single shots out of the computer is to take screen shots. Screen shots are a tricky business. Hood manufacturers, such as Photographic Sciences Corporation of Webster, New York, and film recorder manufacturers, such as Matrix of

Orangeburg, New York, claim they make better images. But it takes practice to get good screen shots.

A Nikon with a 135mm lens and diffusion filter produces high-quality screen shots. The diffusion filter blurs the lit pixel areas so they fill the black mask of the TV or film recorder. The 135mm lens minimizes the parallax problem caused by the curvature of the screen.

Unfortunately, the eagle-eyed camera detects the darkened bars, or scan lines, on the screen that your eyes are too slow to perceive. In fact, the camera is picking up

an *absence* of scan lines. Since the computer must constantly refresh the screen display, the absence of the computer's refresh scan leaves black bars across the screen. To avoid getting scan lines on the film, your camera's exposure must be under 1/10th, a speed that's in sync with the refresh rate of the computer. Additional fiddling with film speeds, F-stop settings, and light-meter readings will undoubtedly lead to a lot of experimenting before you are able to take a good screen shot.

If you're not ready to become the Ansel

A Bag of Animation Tricks

Here's a step-by-step comparison of manual versus PC-aided animation.

Conventional Animation Techniques

Step 1: The storyboard. A storyboard is a visual outline. The artist creates a quick sketch of the main pieces of action needed to tell a story.

Step 2: Key frames. Key frames are hand-drawn illustrations that show where a significant action begins and where it ends. For example, a character may initially have his lips pursed and then break into a smile.

Step 3: In-betweening. Between key frames lies the stuff animation is made of. To get the key frame character to "smile" and make the process appear smooth, the artist must create a series of individually rendered drawings. Fifteen minutes of viewing time requires 21,600 drawings. The in-betweening process kept many cartoonists busy at the old Disney Studios.

Step 4: Pencil test. A pencil test is the animator's "flip book." The initial drawings are photocopied onto pieces of acetate called cels and then filmed. The film serves as the animator's preview to check the moving sequences. If any movements don't look right, it's back to the drawing board.

Step 5: Backpainting. First, the drawings are hand-inked to highlight lines. Next, the acetate is hand-painted to add color to each area.

Step 6: Sandwiching. You can create

either background or foreground elements using the first five animation steps. Step 6 lets you physically sandwich together layers of cels to create a colorful single frame of animation. This manual process does not let you sandwich more than six cels together because the acetate would be too opaque. The cels must also be pin-registered so they all align prior to filming.

Step 7: Filming. A camera records the images, and sound is added.

Computer-Aided Animation

Step 1: The storyboard. The storyboard is usually created manually.

Step 2: Key frames. The key frames can be drawn, stored, and edited using sophisticated line-drawing software. They can also be hand-drawn sketches that enter the computer via a digitizing device. Software programs let you rotate, flip, copy, scale, mirror, and shade the drawings. Drawings can be immediately antialiased.

Step 3: In-betweening. The computer can extrapolate and render the in-between positions of the key frames. This area of animation, relatively new on the PC front, is one of the animator's greatest potential timesavers.

Step 4: Pencil test. Some animation software lets you string together individual sequences and test for motion right on your screen.

Step 5: Backpainting. You can electronically "ink" the lines using the computer's paint system and then use the host of available colors to "paint" the frame. Paint systems with various textures, paint brushes, luminosity, and colors let you do this rapidly and consistently. With fill capabilities you can define whole areas with color. Unlike manual operations, this process doesn't require you to worry about trying to match a color or you may have previously used or to compensate for the effect of sandwiching on your color. The colors are determined by the software and are consistent from frame to frame.

Step 6: No sandwiches here. Instead of having to sandwich multiple cels to create a single frame, you can compose the frame on the CRT screen. There's no alignment or density problem. Old-time cartoon animation required separate cels for each part of a character's body. You can, for example, roll the character's eyes without redrawing the whole figure. The computer lets you work with an entire character, modifying sections as you go.

Step 7: Filming. Every day there are new techniques being developed to have the computer drawing transferred to video or film medium. Typically, the images are loaded into a frame buffer and filmed or videotaped one at a time.

—Robin Raskin

Adams of the screen display, you should invest in a camera hood. These cone-shaped devices place the monitor at one end and your camera at the other. The Kodak Instagraphics Slide Imager and Adapter and the DataCam camera are both dedicated cameras. With both models, the focal length and distance are built into the hood and the camera. You just hold the hood up to the screen and shoot. The DataCam model has diopters built-in to eliminate the parallax problem. Kodak has diopters for its Instamatic but not for the 35mm camera. The Kodak Instagraphics Hood comes with its own Kodak Instamatic and an adapter for your own 35mm camera. The DataCam comes with a dedicated 35mm camera.

The Next Step

The next step up the price/performance ladder is a film recorder. Optical film recorders, which start at about \$1,500, shoot a picture off a black-and-white monitor with three-color filter exposures. Such digital recorders as the high-resolution, pin-registered Matrix QCR transfer the image through digital magic. Don't forget that film recorders sometimes show slight misalignments from slide to slide because of registration problems. If the 35mm camera or slides are not pin registered, the resulting animation has an unpleasant jerkiness.

My experiments of shooting the computer screen with an 8mm camera resulted in grainy images; however, mysteriously, there was no evidence of scan lines. The graininess, when transferred to videotape, left an image that was too degraded to be useful.

For animatics, or rough-cut commercials, I often use a video color camera to shoot the computer screen directly to a 1/2-inch videotape. I usually experience some focus and color loss, which causes a sort of moiré effect, but it's a perfectly suitable preview image to test theoretical animation moves quickly and at a relatively low cost.

You can obtain a very high-quality image by recording directly onto 3/4-inch videotape. Cubicomp's high-end version, Polycad 10V, has an NTSC signal, an external sync generator, and an external color encoder. This video camera enables

you to send images directly to the video recorder.

Rent or Buy?

If you don't want to invest in all this equipment or you want to try out some of these techniques before spending any money, you should rent time in an electronic studio, such as Coddbarrett Studios in Providence, Rhode Island. After 8 hours of experimenting with Coddbarrett's sophisticated equipment and a handful of Cubicomp disks, I produced a 3/4-inch animated videotape.

If you're not ready to become the Ansel Adams of the screen display, you should invest in a camera hood.

Although I was generally pleased with the results at the studio, I learned some important things about transferring frames from a microcomputer to a videotape. Some of my computer screens were too full to produce the desired effect on the videotape. As my image journeyed from my 512 x 512 computer monitor to the Coddbarrett computer, out to the 525-line monitor, the Sony deck, the deck monitor, and the 3/4-inch tape, I suffered minor losses: off-center images as well as lost tops and bottoms.

What is the final solution? It takes a mixed bag of tricks. Depending on the effect you ultimately desire, the cost, and the availability of facilities, you will inevitably find yourself mixing and matching myriad electronic techniques as I did. Fortunately, rental services allow you to dabble at minimum expense until you have a better idea of what you need.

Today's computer graphic animators are encountering the same hurdles as the data and text folks who came down the pike before them. While pictures may be worth a thousand words, they are also considerably harder to get in and out of the machine. But without a doubt, the PC has become an important element in the graphic animator's paintbox.

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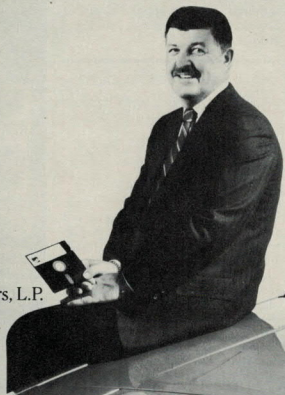
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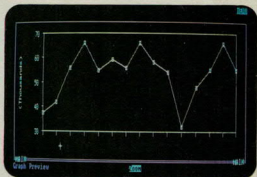
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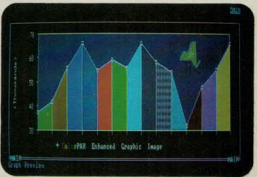
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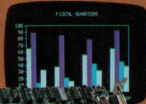
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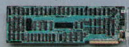
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When IBM and Microsoft designed the DOS subdirectory scheme (introduced with DOS 2.0 more than 2 years ago) for managing files stored on hard disks, they thought it was so spiffy that every PC software developer would immediately rewrite its programs to take advantage of the new feature.

Not only did every software developer not join the subdirectory parade, but IBM and Microsoft didn't even update all of their products to work with the new system.

The real sin, however, was that IBM and Microsoft didn't provide anything in DOS that would enable older programs to access files in any directory other than the current one. They did, of course, provide the DOS PATH command that allows programs, including .EXE, .COM, and .BAT files, to be used regardless of what directory they are stored in, but nothing like it has ever been released for data files. As a result, 2 years later, many users don't take full advantage of the otherwise useful subdirectory

system for organizing their files on hard disks.

Several software companies now offer utility programs that provide a PATH-like facility for data and overlay files. These programs enhance DOS's own file functions to let them find files in other subdirectories and virtual disks on your hard disk. They, in effect, create their own paths for DOS to follow. Although most of the companies that market these products are small, independent software shops, one purveyor in this field, oddly enough, is IBM itself.

Five such products are reviewed here: *File-Path* Versions 2.0 and 3.0, from SDA Associates in San Diego, California; *File Facility*, from IBM in Boca Raton, Florida; *DPATH*, from Personal Business Solutions in Frederick, Maryland; and *EasyPath*, from Polygon Software in New York (see the comparison chart in Figure 1). Most are inexpensive—ranging from \$19.95 to \$34.95—except for *EasyPath* which, at \$100, isn't as easy on your wallet as it is on your data files. (See sidebar, "The Mechanics of DOS-Enhancing Software" for an explanation of the enhanced DOS functions and extra features of these programs.)

DPATH

DPATH is the least elegant of the systems I reviewed. The program's syntax is nonstandard: it requires spaces rather than semicolons between directory names in the data path and a Q or X to terminate the specification and other similar Control characters. Worse yet, although the documentation (and the previous sentence) leads you to believe that you press the Q or X key combined with the Ctrl key, you don't. You have to insert a caret (^) before the character. You can avoid this syntax problem by using *DPATH*'s full-screen editor to specify and change paths (invoked through the DMAINT program). But this process is time-consuming, and you probably would not want to use it after you become used to having the program on your system.

DPATH works well enough once you've finished learning how to specify a path, but the program design seems to assume it's only required when you're using programs written for DOS 1.1 or 1.0 and not for programs written for DOS 2.0 and later versions. This is a shortsighted assumption that limits the flexibility and usefulness of *DPATH* when more recently written programs are used. For example, when *DPATH* is in use, the DOS search function works when the old function call

(11H) is used but not when the new call (4EH) is used. Because of the way DOS is designed, this search problem means that the DIR command will or will not list files on the data path, depending on the DIR specification used. DOS is not unique in mixing the old and the new, and you may find some parts of some programs work

For \$100, EasyPath, the one-man band of the data-path crowd, does absolutely everything that you could possibly want and probably more than you can safely use.

with *DPATH*, but others do not.

DPATH needs completion and some revisions of its syntax and documentation before I'd seriously recommend it.

EasyPath

For \$100, *EasyPath*, the one-man band of the data-path crowd, does absolutely everything you could possibly want and probably more than you can safely use.

One of its nifty features is its ability to specify exactly which paths DOS should follow to find each file. *EasyPath* is powerful, but it may not prove useful if all you want to do is tell all programs to look in a particular directory for control or help files. *EasyPath* can do that too, but its syntax can be tricky, and if you aren't careful, you'll be chagrined to discover that your programs can no longer find files in the current directory.

A program with as many features as *EasyPath* takes up memory. Consequently, because of its design, the installation program has to modify your copy of COMMAND.COM (the DOS Command processor)—a dubious practice at best. (A Polygon representative agreed with this position but stated that the company has experienced no problems with its modification program).

EasyPath is not for average users, but rather for a systems designer who's installing a custom program and wants to make sure users retrieve and store data in exactly the right places. It gives them the same tools that IBM's mainframe MVS system "DD" cards provide. In addition, if you're installing a local area network, *EasyPath* is a dandy product because it can provide levels of file integrity beyond the ability of most LAN software. In its place, it's the best product around, but it may be too sophisticated for many.

File Facility

The first person who comes up with a reasonable explanation of why IBM offers *File Facility* as a \$19.95 product in its Personally Developed Software line rather than for free in DOS gets to use *PC Magazine*'s executive editor Paul Somerson's souped-up AT for the afternoon. And crazy as it may seem, *File Facility* is just about the best of this breed. It's an intuitively obvious program that simply uses the current DOS path to define where to search for files and supplies an override to that path if you need one.

File Facility's documentation is superb. It clearly explains how to use the product and adds a full explanation of how *File Facility* works. The icing on the cake is a programmer's guide that tells you which DOS function calls are and are not supported and why. The folks who write

Data-Path Programs					
Product Name	DPATH	EasyPath	File Facility	FilePath 2.0	FilePath 3.0
Price	\$25	\$100	\$19.95	\$24.50	\$34.50
Enhanced DOS Functions					
Open a file	Yes	Yes	Yes	Yes	Yes
Create a file	No	Yes	Yes	No	No
Search for a file	Yes	Yes	No	No	Yes
Delete a file	No	Yes	No	No	No
Rename a file	No	Yes	No	No	No
Extra Features					
Data-path override	Yes	Sometimes	Yes	Yes	Yes
Use current PATH	No	No	Yes	No	Yes
Use DOS PATH syntax	No	No	Yes	Yes	Yes
Extended Dir. syntax	No	No	No	Yes	Yes
Edit data path	Yes	Yes	No	No	Yes
On/off switches	Yes	Yes	Yes	No	Yes
Save/restore data path	Yes	Yes	No	No	Yes
Execution path option	No	Yes	No	No	Yes

Figure 1: This chart compares five DOS-enhancing utility programs.

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YES	YES	NO
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Jerry Pournelle, BYTE: "What I think the computer industry is headed for: well documented, standard, plenty of good features, and a reasonable price."

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(*) Benchmark run on an IBM PC using MS Pascal version 3.2 and the DOS linker version 2.6. The 179 line program used is the "Gauss-Seidel" program out of Alan R. Miller's book: *Pascal programs for scientists and engineers* (Sybex, page 128) with a 3 dimensional non-singular matrix and a relaxation coefficient of 1.0.

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The Mechanics of DOS-Enhancing Software

Here are the features to look for in DOS-enhancing utility programs beyond the minimum capability of opening a file.

The five data-path programs reviewed in the main article share some important functions, which deserve further explanation. These functions fall into two main categories, those that assist DOS to find your files in other disks and subdirectories and those that make the product easier to use. In the main article's Figure 1, and in this sidebar, I've called these categories Enhanced DOS Functions and Extra Features.

Enhanced DOS Functions

The data-path products allow these DOS functions to find data files and program overlays outside the current directory.

Open a file. Opening a file to read its data in a directory (or directories) other than the current subdirectory is a minimum requirement for all five products tested. They all have this ability.

Create a file. The ability to save a file that was opened and modified in a specified subdirectory is available in some of the products. It's usually an option, and I don't recommend using it. If you use a file from another subdirectory and modify it, you should save it in the current directory. You can always move it back later if you want to.

Search for a file. Some applications, such as *MultiMate* and *IBM Professional Editor*, will not open a file unless it can be found using the DOS search function call, which works as if the program were executing an internal DIR command. This ability may be important for your applications, but it is not used by most.

Delete a file. If you issue a DEL or ERASE command (or your application program does it for you), the program will find the file in a directory previously specified in the data path and erase it. Be-

cause this ability can be dangerous, you may wish to avoid programs that know how to do it or at least avoid using the feature.

Rename a file. If you rename a file that's in a specified directory in the current data path, it will be renamed in its own directory, not the current one. You'll have to try this ability out in your own environment to see what it does to you, but it can be dangerous (that is, it can cause program to crash) if your application automatically renames a file to backup file, modifies it, and then deletes the backup when the work is done.

Extra Features

These features make the data-path programs easier to use.

Data-path override. This feature allows you to override the current data path by specifying your own path in a command or internally from within an applications program. This function can be more important than it seems at first because you may have specific needs that are not addressed in the current data path.

Use of current DOS path. Using the current DOS path means you don't usually have to do anything but install the product. Whenever you specify a path for DOS, the product will follow and allow the DOS PATH command specification to become the current data path.

Use of DOS PATH syntax. This feature allows you to learn one (somewhat complicated) command syntax once. The product does not have to use the current DOS path to have this feature. It can use the same syntax in its own command. The PATH command syntax is

```
C>PATHDIR1;DIR2;DIR3
```

The DIR1, DIR2, and DIR3 parameters

represent the subdirectories to be searched; the order of the search is specified by their order in the PATH command. You separate the subdirectories by semicolons and disable the PATH command by requesting a null path

```
C> PATH:
```

Extended directory syntax. A product can extend the specification by allowing DOS wild cards (* and ?) in data-path directory names and by requesting all subdirectories in a directory to be searched. This feature can be useful because the total length (in characters) of the path specification is usually limited.

Edit current data path. Editing, as opposed to respecifying, the current data path may be handy when you need to temporarily add or insert a subdirectory to it and then delete it without changing the basic path. Consider this an advanced feature because it's probably just as easy to respecify the whole data path (as you already have to do with the DOS PATH command).

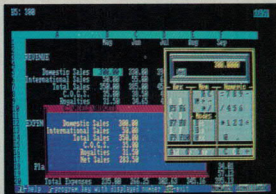
On/off switches. With this handy feature, you can switch the data path, and possibly some of its features, off, then switch it back on without modifying it.

Save/restore data path. Many programs let you save a path specification in a file for later use. You can achieve the same result by using these programs in batch files, but some products offer additional tools for you to use.

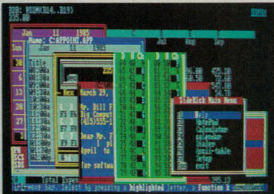
Execution path option. Some programs allow you to execute other programs without first exiting to DOS. Generally, these programs cannot make use of the DOS path to find these .EXE, .COM, or .BAT programs. Several data-path products allow these programs to use their own paths to find other programs.—J.D.

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SUBDIRECTORIES

the DOS manual should take a close look at *File Facility's* documentation.

File Facility offers a file-create option, but the documentation tells you why you should avoid using it and gives clear exam-

ples using actual (IBM, of course) products. The same type of thorough explanation goes into why file-search and rename capabilities are not supported.

At \$19.95, Big Blue has a small-time

winner on its hands; *File Facility* is also available in a package with four other utilities for \$56.95. If you cherish the simple life, *File Facility* is for you.

FilePath, Versions 2.0 and 3.0

If you can't use the DOS PATH for files, another option is a command that uses the same syntax so that you don't have to learn new things to use. That's just what SDA's *FilePath* has been offering users for over a year (to my knowledge *FilePath* was the first data-path product on the market). Version 2.0 is for the general users, and 3.0 is aimed at advanced users and the systems development crowd.

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Personal Business Solutions, Inc.

P.O. Box 757

Frederick, MD 21701

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Requires: DOS 2.0 or higher.

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EasyPath

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363 Seventh Ave.

New York, NY 10001

(212) 563-5858

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CIRCLE 757 ON READER SERVICE CARD

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(800) IBM-PCSW

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CIRCLE 756 ON READER SERVICE CARD

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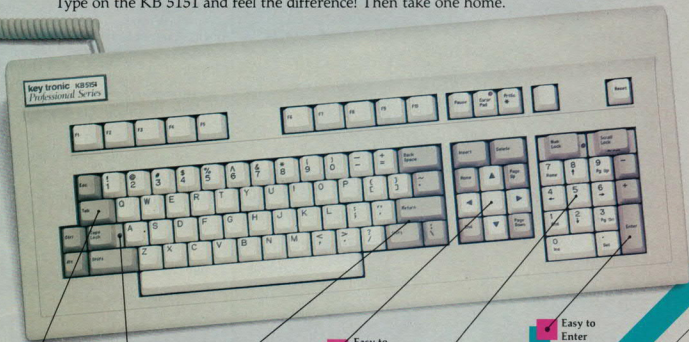
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SDA has established a strong niche in the end-user market with *FilePath* Version 2.0 and is aiming at the systems development market with 3.0.

tained in a specified directory be included in the data path. That option can be quite powerful, such as in the command

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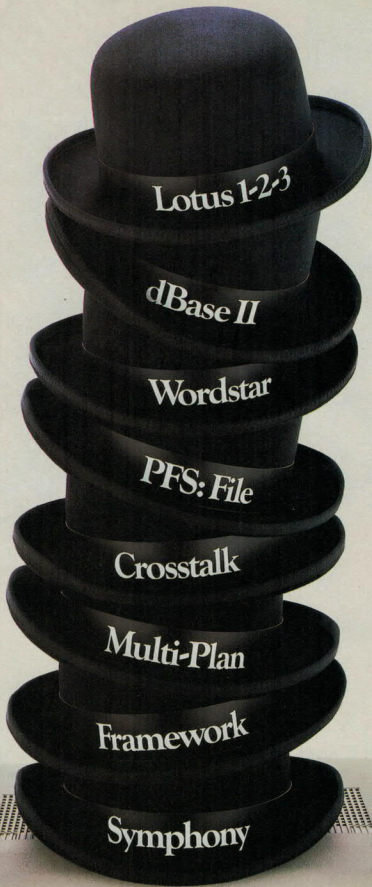
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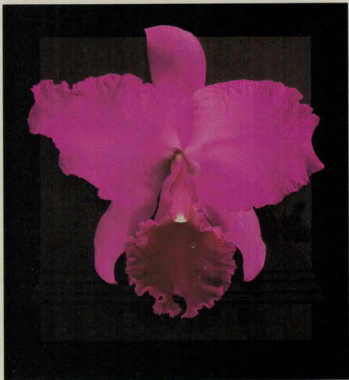
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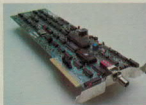
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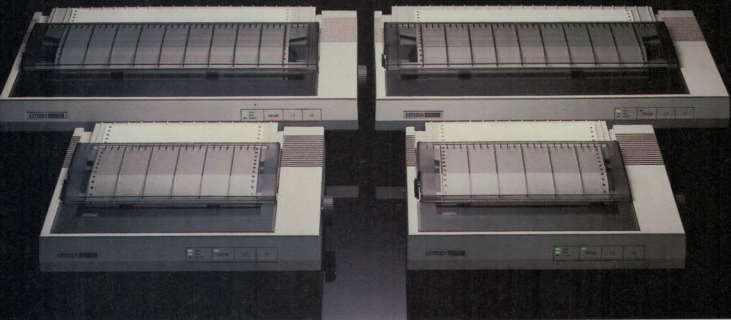
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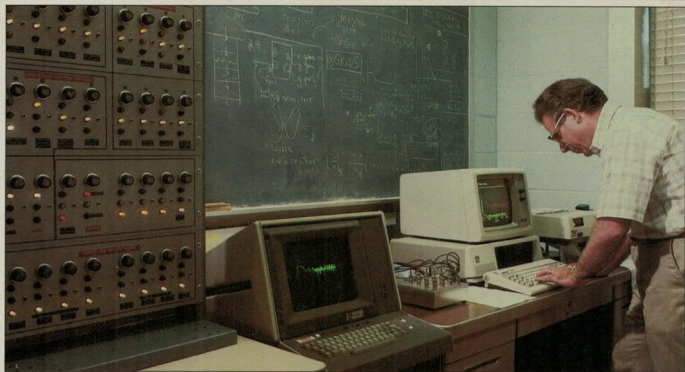
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S·I·M·U·L·A·T·I·N·G NUCLEAR ACCIDENTS

At the Brookhaven National Laboratory, a PC working in tandem with a computer used for simulation helps scientists study ways in which nuclear power plant accidents can be avoided.

The Brookhaven National Laboratory's high-flux beam nuclear reactor towers above the trees of its bucolic Long Island setting, visible for miles around. But the reactor is not the Brookhaven Department of Nuclear Energy's only sophisticated research tool; it also has some familiar IBM PCs. They hold their own with computers specialized for simulation, and sometimes, they even run the show.

Here, Dr. Wolfgang Wulff and his group of scientists use several computers as well as customized software to simulate potential nuclear power plant accidents. *Flight Simulator* is probably the most

familiar simulation software to PC users; it enables you to fly under bridges and make crash landings without even messing up your hair. As with the pilot-training *Flight Simulator*, nuclear reactor behavior simulation has real life-protecting value, since its ultimate use is to prevent a nuclear power plant accident. It can help designers alter plant architecture and procedures to

provide data needed during a crisis.

Of course, most procedures at a nuclear power plant are automated. Dr. Wulff explains that in the event of an accident, many automated steps occur in rapid succession: "Pumps are shut off, valves are closed, and emergency coolant is injected." In such a situation, the plant's computer system also eliminates a lot of impossible things. That is, it gives you only two or three possibilities for what has occurred and what course to follow. The operator can then call up the emergency procedures for these situations on the screen.

"At the Three Mile Island nuclear plant

NUCLEAR SIMULATION

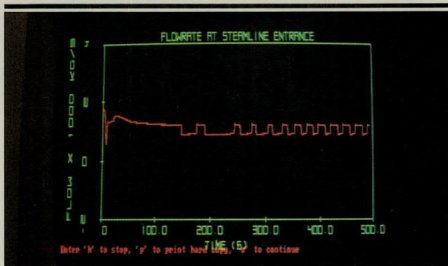
[near Middletown, Pa.],” Dr. Wulff continues, referring to the accident that occurred there on March 28, 1979, “a lot of these things were automatic, but then 6 hours later there were still the high pressures and high temperatures. It was a condition that we hadn’t seen before, and we didn’t have procedures on how to recover. When you are in a situation that no one has thought of before—one not written up in the procedures—that’s when you need a computer simulation.” The status of the plant at the critical moment can be input into the simulation program and the effects of alternative actions simulated.

Dr. Wulff would like to see nuclear power plants install simulation programs to run in parallel with plant operations. If a plant’s real-life computerized distress-analysis display system indicated that a valve had stuck or a thermal coupler had melted, these signals could be compared with the simulation program’s results; discrepancies would aid in diagnosing the problem.

Fortunately, a plant would not have to be in such dire straits before a simulation program would be useful. By running simulations of a plant as it is currently designed and administered, plant managers can consider possible preventive measures. “Based on the results,” explains Dr. Wulff, “a plant may do what is called backfitting, but that costs a lot of money. Many times plants make administrative changes or change the control system to create another safety trip.” Like the simulators used in training pilots, a nuclear reactor simulator is an invaluable training tool for plant staff.

Calculation programs, rather than full-fledged simulation programs, have been available for some time, but using these, it could take several months or a year to arrive at an answer to a problem. According to Dr. Wulff, it took groups of researchers 3 months to compute how to fix the reactor after the accident at Three Mile Island. Such intensive effort, which requires long number-crunching programs, is very expensive. Dr. Wulff says that after TMI, researchers began exploring different approaches.

The Brookhaven group began looking for smaller, special-purpose computers and decided on the AD 10, built by



Each line of the graph represents one output of the nuclear reactor simulation.

Applied Dynamics International, Inc., of Ann Arbor, Michigan. Dr. Wulff says the AD 10 can't be used for much else besides simulation. But at \$250,000 per machine, Brookhaven's two AD 10s cost a tenth of what a big computer costs, which puts them in a range a utility can afford and allows much faster computing. The AD 10 runs 3 to 5 times faster than real time, depending on the problem being solved, and is 10 to 30 times faster than the CDC machines that the Brookhaven group previously used, according to Dr. Wulff.

On obtaining the AD 10s—which, together with their operating software, MPS 10, are often referred to as System 10s—the Brookhaven team wrote a customized simulation program called High Speed Interactive Plant Analyzer, or HIPA. HIPA simulates a boiling water reactor. When attempting to simulate a nuclear reactor, some laboratories examine its thermal stresses or the nuclear physics (neutronics). Brookhaven has chosen to concentrate on the hydraulics, which is concerned with the behavior of the coolant and the resulting temperatures, so it uses a simplified model for the neutronics part.

Even with this simplifying set of assumptions, a simulation program is extraordinarily complex. As Dr. Wulff explains, “We are dynamically solving the conservation laws of mass, momentum, and energy. We are integrating some 250 differential equations, and we are computing 4,000 parameters.” HIPA de-

mands the combined computing power of two AD 10s, a PDP-11 mini-computer—and an IBM PC-XT.

The PC Gets Involved

The PC actually serves as a master terminal to this whole system. From the PC, which is in an office, the researcher communicates with the PDP in the computer room over a 1200-baud phone line, telling it to start each of the two AD 10s located a few feet away. Before the PC was brought in, two terminals at the PDP had to be used, one for each AD 10. The PDP, in turn, loads the two AD 10s' combined million words of memory with HIPA and with large tables of precomputed constants. With one interpolation of the table, an AD 10 can do what a general-purpose computer takes 100 arithmetic operations to accomplish. This speed is a major factor in reducing the time it takes to obtain an answer from several weeks to several minutes. The two AD 10s share the task, with one handling the neutron kinetics, for instance, while the other works on the hydraulics. When they need to communicate, the data is transmitted through a high-speed, 20-MHz, 16-bit bus that runs under the floor between the two telephone-booth-sized machines.

The staff also uses the PC to prepare and store certain kinds of data that are then passed through the PDP to the AD 10s. One example of such data is the scaling factors. The AD 10s only work with whole

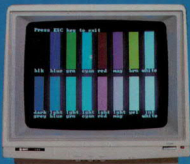
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NUCLEAR SIMULATION

numbers or fixed-point arithmetic, which increases their calculation speed considerably. But since the AD 10s use 16-bit words, the largest number they can work with is plus or minus 32,000. Yet much larger numbers have to be calculated; for instance, steam pressure might easily be more than 32,000 psi.

Stan Lekach, a scientist who has since moved to Softcon in San Francisco, used the PC to solve this problem. "By having it divide the values for each parameter by an experimentally determined constant, each value, as well as the results of the calculations in which it is used, will never be greater than plus or minus 32,000. After doing the calculations, the PC scales them back to their real values."

Another type of data stored on the PC or on a floppy disk is the long list of parameters describing a particular reactor. From there it can be passed to the simulation program in the AD 10s.

Going Digital

The reactions and processes actually taking place in a nuclear power plant occur in analog rather than digital form: steam pressure and temperature both change in a smooth flow instead of in discrete jumps. To mimic this change, the AD 10s, which are digital machines, can input and output analog data, making the conversion to and from digital themselves. These inputs, also called transients, are the elements in a nuclear plant's processes that are temporary and can be altered. For instance, steam flow and pressure are both transients that the system can alter by opening or closing valves. The usual practice is to set two of these transients in a steady state, then vary an element such as a valve to see how it affects the transients.

In the office, near the PC, is an analog input control panel—a metal board about 3 feet high and 2 feet wide—that sports an array of dials. Until Stan Lekach started programming the XT, the team always used this panel to set the level of inputs into the simulation program. Now it can also use a menu on the PC to set the transients. By pressing a key, the researcher rolls through the list of inputs and can then type in the value. The PDP sends these digital inputs to the AD 10s, bypassing the analog-to-digital conversion.

The PC can handle analog or digital outputs from the AD 10s, and both forms of output are useful. One of the first programs Lekach wrote for the PC was for accepting analog outputs from the AD 10s, bypassing the PDP. As he explains, "The AD 10s were already dumping analog output, so I could tap this data without slowing down the simulation at all." He rigged up a small panel that gathers 16 analog channels coming from the AD 10s. He then connected these to a Tecmar Lab Master board in the XT, which does digi-

Fortunately, a nuclear power plant does not have to be in dire straits before a simulation program would be useful. By running simulations of a plant as it is currently designed and administered, plant managers can consider possible preventative measures.

tal-to-analog conversions. Using C language, he programmed the Tecmar board to convert the outputs and store them on the hard disk. Lekach says he chose the DeSmet C compiler, sold by C Ware in San Jose, California, because of its fast compilation time.

Later, Lekach programmed the PC to accept output that had already been converted to digital format by the AD 10. In this case, more than 80 outputs, rather than 16, are available to the XT. This large number of values takes up memory and would slow down the simulation if the PC had to take the time to store all of them. So instead of storing these outputs on the PC, the PDP acts as a virtual disk for the PC, holding the outputs until a researcher makes a request to see them via a menu on the PC.

It isn't redundant to have both methods, explains Lekach. "The analog output lines have high speed, so they are good when a transient has high oscillations and you want to capture each change. The digital

output is useful when you need to compare many different values."

Graphic Simulations

From the beginning, Dr. Wulff's group has used an oscilloscope and its plotter to make graphs of the output values. "The problem," says Dr. Wulff, "was that they didn't have any labels. We couldn't show axes with labels for time, pressure, or temperature. So we turned to the IBM PC." Nor could the graphs be readily plotted in color. Lekach's C programs for the PC solve both these problems.

Using either digital or analog outputs, the researcher follows a series of menus to select which transients to plot. The correct labels automatically appear on the axes, as do the appropriate scales, so that the full graph will fit onto the screen. The two transients are always presented in contrasting colors. Even though the color helps, the team decided to limit each graph to two transients, since the lines become difficult to distinguish with more than two. The analog outputs are actually voltages, and in this case, the PC does the additional task of converting the voltages directly into screen coordinates.

The graphs, which are drawn as the simulator runs, are an impressive demonstration. In one example, Dr. Al Mallen, a scientist working for Dr. Wulff, set particular levels of steam flow and pressure as the transients, and the labeled axes appeared on the PC monitor. The two curves, the steam flow line represented in red and the pressure line in green, began moving in parallel horizontally across the screen. Then Dr. Mallen chose a particular valve from the list of transients and toggled a key to close it. The red flow curve immediately began to drop as it moved from left to right across the screen, and the green pressure curve rose sharply. This pressure increase caused the simulated safety valve to open, and as a series of valves opened and closed in response to the change in pressure, the flow curve rose and fell accordingly.

In an even more dramatic scenario—the kind that HIPA can help plants avoid—Dr. Mallen disabled the control rods so that they could not go into the core. The green pressure curve began to rise, causing the simulated pressure-release

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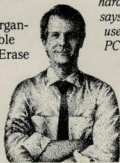
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valves to close. But then the power, represented by a red line that indicated the neutron intensity of the core, was unable to shut itself off. The red power curve began to rise, rapidly reaching twice as high as normal; then it dropped just as quickly, so that the total energy released was manageable. However, the power still stayed on, though at a lower level, until the control rods were re-enabled.

In another scenario, Dr. Mallen caused a valve to remain stuck in the open position. The red power line rose and continued upward, going right off the top of the screen. Graphics on a PC are a tidy—and safe—way to test out a nuclear power plant accident.

On the Road

Programming a PC to graph the simulations has resulted in an added bonus. Dr. Wulff and his team can now take their PC software with them to give demonstrations of their simulator's capabilities to interested groups. They use a PC at the site they're visiting and dial in to the PDP via modem. With this set-up, they're able to run HIPA just as they would at the lab.

While Dr. Wulff and his staff are very pleased with HIPA, they've already got plans to extend its use. Dr. Wulff would like to increase the speed and computing power of HIPA by getting a VAX to replace the PDP and by using the next generation of machinery manufactured by Applied Dynamics—the System 100—which has a capacity for simulations 10 times more complex than the AD 10s can manage. He'd like to obtain a color monitor with higher resolution and a system for creating videotapes of the graphs as they are being drawn.

Dr. Wulff says that other countries have data that would help his group further refine their simulations and that some combustion engineering companies have focused more closely on other aspects of nuclear reactor simulation. He has dialogues going in both areas, with the hope of exchanging information.

In the meantime, the group at Brookhaven is writing a new program to simulate a pressurized water reactor. And a PC-XT, complete with 512K, an 8087 chip, and analog/digital conversion board, may get to play a part. ■

Fundamentals of Fractals, Part 2

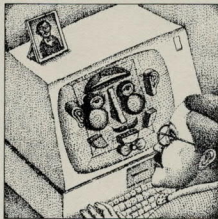
With the fractal algorithm, even micros like the PC can create graphic models of irregular, real-world objects.

In a previous column (*PC*, Volume 3 Number 22, 1984, p. 380) I discussed some of the problems of describing irregular surfaces in terms a computer can model. One possible approach—the Koch generator—was examined, but its curves turned out to be too regular for the real world. We need, rather, to find a way of introducing what might be called *controlled randomness* into our mathematical description of things.

Early approaches to modeling real-world phenomena required enormous data bases, contour maps, and hundreds of thousands of polygons—at a commensurate cost in computer time and capacity. In the past decade, however, new techniques have been developed that can produce complex models from very small initial data sets. The preeminent method, or algorithm, is fractal (from “fractional dimension”) analysis. The technique was developed at IBM by the French mathematician, Benoit Mandelbrot. While the full implementation of this algorithm uses massive quantities of calculations and is most often done on large mainframe computers, its flavor can be savored on the PC. With the arrival of better monitors and the new graphics boards from IBM and others, we may even be able to approach the quality of the work previously restricted to the larger machines.

Various researchers have developed algorithms for using fractals to describe real-world surfaces in computer animation. While Mandelbrot formulated a mathematical method for calculating a fractal surface, his method is less satisfactory when applied to computer animation. One

1985/no. 11



major problem is its inability to force the curve to pass directly through certain points—the specific elevations shown on a topographic map, for example. Another difficulty has arisen when the process is reversed: if the picture scrolls up, then reverses and scrolls down, two different images are created. Additionally, Mandelbrot's original method also lacked the ability to zoom into or out of selected areas. All these capabilities are required if the algorithm is to be useful for animation.

To sum up, then, the required algorithm must provide detail when requested, but without the need to store millions of data points. It should be reversible so that landscapes can remain stable. It must also be able to force a curve to pass through specified points. All these demanding requirements are met by the fractal subdivision method.

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The Fractal Algorithm

If we were to write a program that randomly drew lines on the screen, chances are slim that this program would draw a model of a mountain or a river. What we really need in order to create computer models of complexly shaped natural ob-

jects like mountains and rivers is a means of generating controlled randomness. This is what the fractal algorithm provides. For example, we can divide the three-dimensional surface of a mountain range into a series of cross sections. If we then take successive slices of the range and overlay

them, we will get a crude, poorly defined picture of the mountains. Using fractals, however, we need only loosely define the general shape of the range; we can then let the algorithm fill in the details. This is what the **FRACTALS.BAS** program shown in Figure 1 does.

```

10 '=====
20 ' Fractals
30 ' generate fractal curves using recursive midpoint reduction
40 ' copyright 1984, s m estvanik
50 ' 9 JULY 84
60 '=====
70 ' m = number of points on a line
80 ' p = x location on a line
90 ' h = height at that value of p
100 DIM MP(12),P(12,12), H(12,12), T(20,200,2) 't(nlines, pts per line)
110 DIM STACK(40,4) 'used to simulate recursion
120 '
130 KEY OFF
140 GOSUB 1000 'get values for lines
150 RANDOMIZE (VAL (RIGHT$(TIME$,2)))
160 '
170 GOSUB 2000 'preview graph
180 ' calculate fractals for each line requested
190 FOR K=1 TO NLINES STEP 2
200 N=0
210   FOR I=1 TO MP(K)-1
220     SP=1
230     STACK(SP,1)=P(K,I):STACK(SP,2)=P(K,I+1)
240     STACK(SP,3)=H(K,I):STACK(SP,4)=H(K,I+1)
250     GOSUB 2500 'call fractal calculator
260     NEXT
270 MP(K)=N 'number of points calculated
280 LOCATE K,5:PRINT "Line";K;",";MP(K);"points calculated"
290 NEXT
300 FOR K=2 TO NLINES-1 STEP 2 'interpolate
310   LOCATE 14,2,0:PRINT "interpolating line";K;
320   IF MP(K-1)<MP(K+1) THEN MP(K)=MP(K-1) ELSE MP(K)=MP(K+1)
330   FOR I=1 TO MP(K)
340     IF T(K-1,I,1)=0 OR T(K+1,I,1)=0 GOTO 370
350     T(K,I,1)=(T(K-1,I,1)+T(K+1,I,1))/2
360     T(K,I,2)=(T(K-1,I,2)+T(K+1,I,2))/2
370     NEXT
380 NEXT
390 GOSUB 3000 'plot lines with hidden line removal
400 END
1000 '===== get data for lines
1010 READ NLINES,M '#lines, points per line
1020 DATA 9,7
1030 READ XMAX,YMAX 'max values for x,y
1032 FOR I=1 TO NLINES STEP 2:MP(I)=M:NEXT
1040 DATA 35, 100
1090 FOR K=1 TO NLINES STEP 2:FOR I=1 TO MP(K):READ H(K,I)

```

(continues)

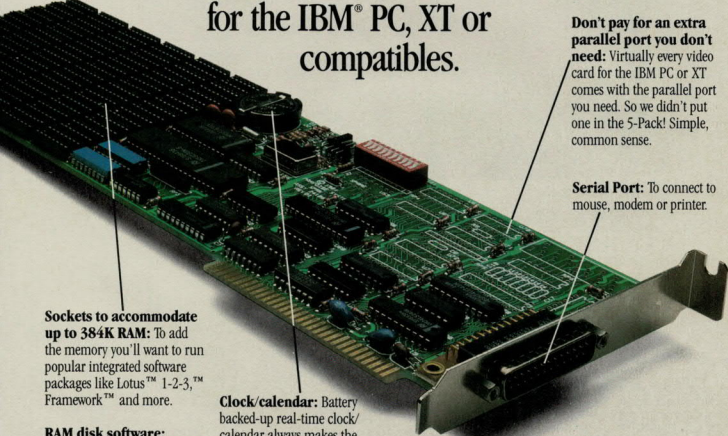
Figure 1: The **FRACTALS.BAS** program. As a start, use roughness = 5 and tolerance = .5.

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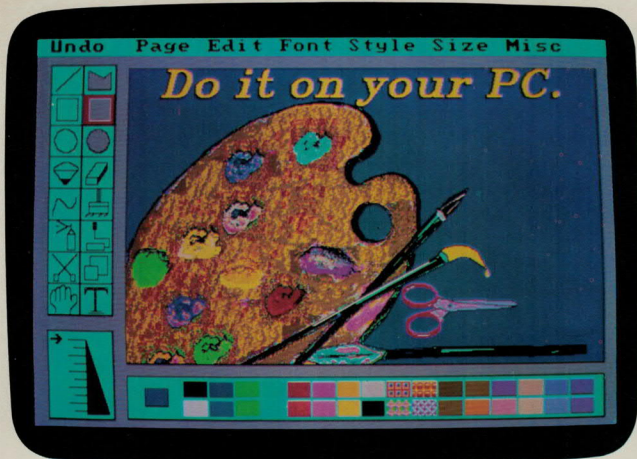
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PROGRAMMING

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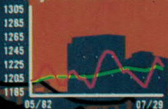
1092 H(K,I)=(H(K,I)-8500)/50      'scaling
1093 NEXT :NEXT
1094 YMAX=(14000-8500)/50
1095 ' Heights for each line, starting at farthest
1100 DATA 11600,12500,11600,12800,11600,11600,10400
1102 DATA 10400, 12000, 10800,11600,12000,13770,12000
1104 DATA 10000,11800,10000,10000,11200,11600,11500
1106 DATA 9600,10800,10000,9800,11200,10400,11200
1108 DATA 8800,10000,9600,9600,9600,10000,11600
1110 'horizontal distances across each line
1112 FOR K=1 TO NLINES STEP 2:FOR I=1 TO M:READ P(K,I):NEXT :NEXT
1115 DATA 1,5,10,15,20,25,30, 1,5,10,15,20,25,30, 1,5,10,15,20,25,30
1117 DATA 1,5,10,15,20,25,30, 1,5,10,15,20,25,30
1120 INPUT "Roughness (2-10)";RUFFNESS      '***** help or description?
1130 INPUT "tolerance (min 2* nlines/100)";TOLERANCE
1200 YINC=50/NLINES
1210 XINC=150/NLINES 'scaling factors for transforms
1250 RETURN
2000 '===== preview initial landscape
2002 CLS
2010 FOR K=1 TO NLINES
2020     FOR I=1 TO MP(K)
2030         T(K,I,1)=P(K,I)
2040         T(K,I,2)=H(K,I)
2050     NEXT :NEXT
2060 GOSUB 3000
2070 RETURN
2500 '===== fractal calculator
2510 WHILE SP>0      'as long as there are values on the stack....
2520     T1=STACK(SP,1):T2=STACK(SP,2)
2530     H1=STACK(SP,3):H2=STACK(SP,4)
2540     SP=SP-1      'pop
2550     IF T2-T1>TOLERANCE GOTO 2610
2560     ' required resolution achieved
2570     N=N+1
2580     IF N>200 THEN PRINT "Overflow of t buffer";:STOP
2590     IF STACK(SP,0)=1 THEN T(K,N,1)=T2:T(K,N,2)=H2 ELSE
        T(K,N,1)=T1:T(K,N,2)=H1
2600     GOTO 2730
2610     TM=(T1+T2)/2 'midpoint
2620     PUSH =RND-.5
2630     HM=(H1+H2)/2+RUFFNESS*(T2-T1)*PUSH
2640     ' push each of the two new segments on the stack
2650     SP=SP+1
2660     STACK(SP,1)=TM:STACK(SP,2)=T2
2670     STACK(SP,3)=HM:STACK(SP,4)=H2
2680     STACK(SP,0)=2
2690     SP=SP+1
2700     STACK(SP,1)=T1:STACK(SP,2)=TM
2710     STACK(SP,3)=H1:STACK(SP,4)=HM
2720     STACK(SP,0)=1
2730 WEND
2740 RETURN
3000 '===== plot lines with hidden line removal

```

(Figure 1 continues)

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INTEREST	75.00	0.00	0.00	75.00	0.00	0.00	75.00	0.00	0.00
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3010 SCREEN 1,0:COLOR 1,0
3020 ' pixel scale: horizontal, vertical
3030 XS=320/XMAX:YS=200/YMAX
3040 '-----transform to tilt landscape
3050 FOR K=1 TO NLines
3060   FOR I=1 TO MP(K)
3070     ' add to each value to move away from borders
3080     T(K,I,1)=2+T(K,I,1)*XS
3090     T(K,I,2)=1+T(K,I,2)*YS      'scale
3100   NEXT
3110 NEXT
3120 PC=0
3130 FOR K=1 TO NLines
3140   IF MP(K)<1 GOTO 3230
3150   PC=PC+1:IF PC>3 THEN PC=0      'cycle thru possible colors
3160   N=MP(K)
3170   LINE (0,200-T(K,1,2))-(T(K,1,1),200-T(K,1,2)),PC 'connect with border
3180   FOR I=1 TO N-1
3190     LINE (T(K,I,1),200-T(K,I,2))-(T(K,I+1,1),200-T(K,I+1,2)),PC
3200   NEXT
3210   LINE (T(K,N,1),200-T(K,N,2))-(319,200-T(K,N,2)),PC
3220   PAINT (T(K,2,1),199-T(K,2,2)+5),PC,PC 'remove hidden lines
3230 NEXT
3240 XS=INPUT$(1)
3250 SCREEN 0,0:WIDTH 80
3260 RETURN

```

(Figure 1 ends)

FRACTALS.BAS incorporates altitudes taken from the USGS topographic map of Grand Teton, Wyoming. When you run the program, you will create two graphs. The first plots the original data (Figure 2). Here the lines are straight and only the most prominent forms of the mountains are evident. You will note, however, that even this limited number of data points is sufficient to describe the general outlines of the picture.

After viewing this crude graph, you press any key. The program continues, and after a brief interval for calculations, you'll see a more realistic view of the range. The second graph (shown in Figure 3) uses both the slices initially pulled from the topographical map and a number of interpolated slices between them. Both sets of slices have been augmented by values calculated using fractals. On a more powerful machine, with a higher-resolution display, the interpolations between the slices would be fine enough to produce true three-dimensionality. On the PC, for now, I'll stop at this lower degree of discrimination, leaving additional refinements to the reader.

Recursive Midpoint Reduction

The algorithm that is used here was described by Loren Carpenter during SIGGRAPH '80. In essence, it consists of first defining a surface as a series of line segments, then returning to each segment and breaking it into a series of smaller line segments. Two variables allow you to control the shape of the resulting curve: *roughness* denotes the level of deviations permitted; and *tolerance* determines how often recursion takes place before the algorithm ends.

Using T1 and T2 as the points defining a line segment, and H1 and H2 as the corresponding elevations, the pseudocode for the algorithm is displayed in Figure 4. Starting with two points, intermediate points are chosen, based both on the roughness factor and on a random variable. The algorithm then calls itself (recursion), using these new values. This process continues until the difference between the two T values is less than the tolerance factor. At that point the values can be stored and plotted.

To generate Figures 2 and 3, I simply applied this algorithm to a series of topographic slices, then interpolated to gener-

ate intermediate line slices. For a more complete program you would want to apply the algorithm across the slices, too, rather than just interpolate them. This would project the randomness upon which the algorithm depends into three dimensions rather than the two shown here.

Details of the fractal program

As indicated, FRACTALS.BAS (Figure 1) uses fractals to create mountain landscapes. It uses IBM BASIC's PAINT commands to circumvent the need for a hidden-line removal algorithm. The original data comes from topographic maps of Wyoming's Grand Teton. Using a manual digitizer (that is, a piece of graph paper), I took elevation readings at regularly spaced intervals, and I then transferred these values to the data statements.

Subroutine 1000 in the program sets up the variables required for the graph. In addition to the actual data, several scaling factors were also set. The user is initially prompted for selectable roughness and tolerance factors. For Figure 1, appropriate starting points would be roughness = 5 and tolerance = .5. Roughness describes

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PC Magazine
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Figure 2: The starting-point, outline view of the Grand Teton.

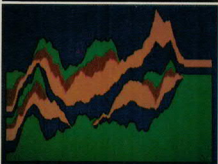


Figure 3: The same vista, following application of the fractal algorithm.

the degree of distortion (jaggedness) to be added. Not surprisingly, low roughness graphs will be smoother than high. Tolerance is the degree of fineness to be calculated. Low tolerance factors result in a greater number of calculations between the initial and the final graphics screens but correspondingly produce smaller intervals between segments. When you run the program, vary these parameters to see their effects on the graphs.

Subroutine 2000 presents the data as initially entered. P() and H() are arrays that hold the initial X and Z coordinates. The X direction is left to right; Z is up and down. The Y direction is forward and backward in the plane of the monitor screen. In this program the Y coordinates are assumed to vary uniformly.

Subroutine 3000 does the actual plotting after first scaling the values to fit on a medium resolution screen of 320 by 200 pixels. After each line is drawn, the PAINT command is used to fill in the area below the curve. This acts as a crude method for hidden-line removal.

The meat of the main program is in lines

200–260. The coding would be simpler in Pascal, C, Fortran, or other languages designed for recursive calls. In BASIC, however, we need to define a stack explicitly. The array STACK keeps a list of four items: the horizontal and the vertical measurements for a line segment. To get things going we enter the values for the first two points and call the fractal subroutine 2500. SP is a pointer to the element of STACK that we're currently working on. The fractal subroutine will then add more items to the list in STACK (pushing) and take some off (popping), as required.

At each recursion we transfer the contents of STACK (SP,n) to four temporary variables. There's no further need for those items in STACK, so the stack pointer is reduced by one. (We've just popped the stack.) Next, we test to see if the two T values are within the tolerance level. If they are, then the calculated values can be added to the list of final values that are being kept in the array T(). The WHILE condition is then checked. If the stack contains any more items, the next one is popped and the subroutine continues. Eventually, the stack is empty and control then returns to line 250.

The interesting part of the algorithm, though, is what happens if the tolerance level isn't met. In this case two new values are calculated. First, an intermediate T is found. This is simply the mean of the two values that were popped from the stack. An intermediate height is also found. This new height (line 2630) is dependent on more than the two previous heights. It is also displaced by an additional amount that is related both to the roughness variable and to a random factor. This gives us two new sets of points to calculate—the intervals from T1 to TM and from TM to T2.

These values are pushed onto the stack and the process continues: ever smaller line segments will be defined and pushed on the stack. Eventually, however, they become small enough to meet the tolerance. At that point we work back up the stack, popping new sets off. In the end we have a list of n points that can be plotted.

Before plotting a second time, however, the program does an interpolation (lines 300–380) to generate additional slices. As stated earlier, this is a simple linear interpolation; a program refinement would be to apply the fractal algorithm here too.

Eldorado

One set of data is rarely enough to prove a point or validate an algorithm. A second set of data points creates another view. (If one set of data works and a second set works, by The Programmer's Rule of Induction the program always works.) This second data set presents a view of the Washington Cascades, showing Eldorado Peak and the Triad. To use this second set, just delete lines 1000–1250 of the original program and enter the lines shown in Figure 5. As a starting point, I recommend you use a roughness factor of 7 and a tolerance of .7.

The Last Fractal

The great value of fractal methods is that they allow highly complex objects to be drawn by simple rules and from a minimum of data. Further, if the same seed is used for the creation of a fractal landscape, the pattern created will be the same even if the view screen moves on and then comes back. This effect was used in the recent movie *The Last Starfighter* during the chase inside the asteroid. The caverns on the screen were created by fractal tech-

```

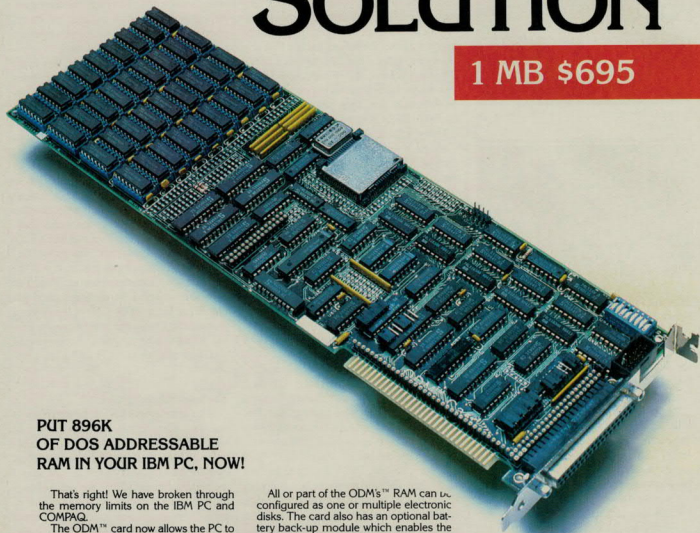
Procedure fractal(t1,t2)
Begin
  If t2 - t1 > tolerance THEN
    tm = (t1 + t2) / 2
    hm = (h1 + h2) / 2 + roughness * (t2 - t1) * random factor
    fractal(t1,tm) ' recursive call to same routine
    fractal(tm,t2)
  ELSE
    plot current values
End

```

Figure 4: The fractal algorithm in logical form.

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```

1000 '====Eldorado Peak===== get data for lines
1010 READ NLINES,XMAX
1020 DATA 4,25
1030 NLINES=(NLINES*2)-1 'leave room for interpolations
1040 FOR I=1 TO NLINES STEP 2:READ MP(I):NEXT '# data points for each line
1050 DATA 9,8,6,6
1060 FOR K=1 TO NLINES STEP 2:FOR I=1 TO MP(K):READ H(K,I)
1070 H(K,I)=(H(K,I)-8000)/25 'scaling
1080 NEXT :NEXT
1090 YMAX=(15000-8000)/25
1100 ' Heights for each line, starting at farthest from view
1110 DATA 12400,12900,12300,12350,11400,11700,12325,11200,10400
1120 DATA 12000,13200,13220,12000,11200,10300,10800,10000
1130 DATA 11600,12200,10800,10000,9600,9200
1140 DATA 12100,10800,11200,10400,9400,9200
1150 'horizontal distances across each line
1160 FOR K=1 TO NLINES STEP 2:FOR I=1 TO MP(K):READ P(K,I):NEXT :NEXT
1170 DATA 7,8,10,13,15,18,20,22,25
1180 DATA 1,3,5,7,10,15,20,25
1190 DATA 1,5,10,15,20,25, 1,5,10,15,20,25
1200 CLS:INPUT "Roughness (2-10)";RUFFNESS
1210 PRINT "tolerance (min"; 2* NLINES/100;")";:INPUT ;TOLERANCE
1220 YINC=60/NLINES
1230 XINC=100/NLINES 'scaling factors for transforms
1240 RETURN

```

Figure 5: An alternative data set for FRACTALS.BAS, (roughness = 7, tolerance = .7).

niques. As the spaceships rocket through the internal corridors, they cover terrain that is continuously variable, yet is entirely retraceable. The effect is to generate an enormous area from just a small descriptive data base. The sparse initial dataset simply grows to become as detailed as needed. If desired, we can also zoom in to look at a smaller section; whatever level we choose to view, the detail will be there.

Fractal Applications

In a motion picture laboratory, after establishing the 3-dimensional grid, a rendering program assigns shading values to make the terrain look more natural. Further refinements then add landscape details, such as shadows, haze, or snow-capped peaks. Through the use of fractal techniques, the time required to create a frame of animation has steadily been reduced, from an hour to less than 5 minutes.

Additional applications that could profit from fractal techniques include training simulators for pilots and others who need real-time 3-dimensional images. Major studios may find it more profitable to generate exotic sets rather than shoot on loca-

tion. Further, both for movies and advertising, mixing live film with fractal-based animation provides worlds and angles impossible for physical cameras.

Of course, there are some practical limits. It still takes 24 frames to form a second of elapsed film time; and the costs of pro-

Fractal techniques will find their way into computer games written for more-powerful micros such as the IBM PC.

ducing computer-generated animation are still inhibiting. A Cray X-MP can produce about 20 minutes of 70-mm film a month. Previous minicomputers were hard pressed to make 2 or 3 minutes of quality film in a year, however, so the economic balance is tilting in the right direction.

And, of course, the PC is no Cray. Nonetheless, fractal techniques will find their way into computer games written specifically for more-powerful micros, such as the IBM PC. More-realistic terrain

can now be modeled, for example. No longer need the lazy-programmer approach be taken, in which scrolling is limited to one or two directions. Fractals permit wider expanses of more detailed terrain and guarantee that the terrain will remain the same no matter the direction from which the player approaches or how many times he's been there before. By varying the pitch and altitude, even in primitive programs, you can achieve relative changes in perspective and angle of approach that mimic flight.

So, to get started in this new graphics dimension, key in Figure 1 or the modem number (212-696-0360) of PC's Interactive Reader Service. For more information, see the following sources: Loren C. Carpenter, "Computer Rendering of Fractal Curves and Surfaces," Computer Graphics: SIGGRAPH '80 Conference Proceedings, July 1980; Benoit B. Mandelbrot, *The Fractal Geometry of Nature* (San Francisco: W.H. Freeman & Co., 1982) (this field's current classic); Benoit B. Mandelbrot, *Fractals: Form, Chance and Dimension* (San Francisco: W.H. Freeman & Co., 1977). ■

User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.



Low-Resolution Graphics

IBM's *Technical Reference* manual briefly describes a low-resolution graphics mode of 160×100 in which all of the available 16 colors can be displayed. The manual further references a special memory map and setup to be defined later. The manual is wrong in stating that this mode is set up as a 40×25 alpha color mode—it's actually an 80×25 alpha mode.

The special setup consists of presetting the even-numbered bytes in the color graphics buffer with ASCII code 222. The character is halved vertically and displays the foreground color on the right side and the background color on the left. The halving of each character yields 160 pixels across the screen. The 6845 controller is programmed to display only one-fourth of each row or two scan lines. This programming yields 100 fourth characters down the screen. The color of each pixel is controlled by the odd-numbered bytes of the color graphics buffer. This is the 8,000 bytes referred to on page 2-56 of the (July

1982) *Technical Reference* manual. As in text mode, each byte represents two pixels: the high nibble determines I, R, G, B for the left pixel and the low nibble provides I, R, G, B for the right pixel.

The accompanying programs demonstrate the use of low-resolution mode. The preliminary program MAPMAKER.BAS in Figure 1 demonstrates how to get into low-resolution mode. It also creates a memory map for the main drawing program, LORES.BAS, in Figure 2. In LORES, the keys 2, 4, 6, and 8 on the numeric keypad move the line you're drawing, while the plus sign and minus sign change the color. The 5 key on the keypad toggles XOR mode on and off, where a white cursor (or black on a white background) is able to move but does not disturb the images it crosses or leave any trail.

The L and S keys control LOAD and SAVE functions. Simply hit the S key and then one letter or number, and the image on the screen will be BSAVED with the name PIC#.BIN, where # is the key hit immediately after S. Make sure to hit a key that is valid for use as a filename. (The small help screen included with the program suggests using numbers only, but any valid character will work here.) To BLOAD a key you've saved previously, hit the L key and then hit the key originally used to save the image. To exit the program and return to normal text mode, hit the space bar.

LRGMEM.MAP is a binary copy of the special memory map used by LORES to save execution time. MAPMAKER writes the map byte-by-byte into memory

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USER-TO-USER

using POKE statements, while LORES merely loads the map in the form of a file. Create the file LRGMEM.MAP by running the MAPMAKER.BAS before you try LORES. Note also that no text is available in low-resolution mode. To get out of low-resolution mode, type SCREEN 2 and hit the Enter key.

Robbie Jones
Amarillo, Texas

Users can adapt this program to put in all sorts of bells and whistles, but the main mechanism is all here. Remember to run MAPMAKER first, which creates the LRGMEM.MAP memory map for the main LORES program. A typical improvement would be to add a line or two after line 410 so that striking Home, PgUp, End, or PgDn (7, 9, 1, and 3 respectively) would move the cursor to the corners of

```
100 ' MAPMAKER.BAS -- creates memory map for LORES.BAS
110 SCREEN 0,0,0,0:WIDTH 80:COLOR 7,0:CLS:KEY OFF:OUT &H3D8,9
120 FOR A=1 TO 4:READ MODE1,MODE2:OUT &H3D4,MODE2:OUT &H3D5,MODE1:NEXT
130 DEF SEG=&H800:FOR A=0 TO 16384 STEP 2:POKE A,&HDE:POKE A+1,&HDE:NEXT
140 BSAVE "LRGMEM.MAP",0,&H4000
150 DATA 127,4,100,6,112,7,1,9
```

Figure 1: The MAPMAKER.BAS program. Run this first to create the LRGMEM.MAP memory map binary file used by the main LORES.BAS drawing program.

```
100 ' LORES.BAS -- by Robbie Jones -- adapted by PC -- run MAPMAKER.BAS first!
110 DEF SEG=64:POKE 23,32:DEF SEG
120 SCREEN 0,0,0,0:WIDTH 80:COLOR 7,1,1:CLS:KEY OFF:PRINT:DRW=1
130 PRINT "First run MAPMAKER.BAS to create memory map, and have it on disk."
140 PRINT "Use cursor arrows to draw. Use 5 to toggle pen/up and pen/down."
150 PRINT "Hit - and + signs to change the color of the line you're drawing."
160 PRINT "Hit S then hit a number from 0-9 to save a screen you've created."
170 PRINT "Once you've saved screens, hit L then number from 0-9 to load them."
180 PRINT "You can't see text in lo-res mode, but type SCREEN 2 if you crash."
190 PRINT "Hit the space bar to END THE PROGRAM!";COLOR 23
200 PRINT SPC(2);"Now hit any key to start..."
210 ' ---- start program and initialize video controller chip ----
220 IF INKEY$="" THEN 228 ELSE COLOR 0,0,0:CLS:OUT &H3D8,9
230 FOR A=1 TO 4:READ MODE1,MODE2:OUT &H3D4,MODE2:OUT &H3D5,MODE1:NEXT
240 ' ---- initialize video memory map for lo-res graphics ----
250 DEF SEG=&H800:BLOAD "LRGMEM.MAP",GOTO 378
260 ' ---- plot a point at X,Y in color C, like PSET (x,y),c ----
270 ADDR=(PTX*(X-1)/2)+(Y-1)*80):*2+1
280 RT.PEL=PEEK(ADDR) MOD 16:LF.PEL=PEEK(ADDR)-RT.PEL
290 IF X MOD 2 THEN COL=(C*16)+RT.PEL ELSE COL=C+LF.PEL
300 PEEK ADDR,COL:RETURN 390
310 ' ---- flash a point in XOR, don't draw, like PSET (x,y),c,XOR ----
320 POK ADDR,OL.PEL:ADDR=(PTX*(X-1)/2)+(Y-1)*80):*2+1
330 RT.PEL=PEEK(ADDR) MOD 16:LF.PEL=PEEK(ADDR)-RT.PEL:OL.PEL=PEEK(ADDR)
340 IF (RT.PEL=15 OR LF.PEL=15) THEN C=0 ELSE C=15
350 IF X MOD 2 THEN COL=(C*16)+RT.PEL ELSE COL=C+LF.PEL
360 POK ADDR,COL:RETURN 390
370 ' ---- simple lo-res draw program, starting in center of screen ----
380 C=1:X=80:Y=80:GOSUB 278
390 VS=INKEY$:IF LEN(VS)=0 THEN 390 ELSE IF VS="5" THEN 440
400 IF VS="2" THEN 510 ELSE IF VS="8" THEN 490 ELSE IF VS="4" THEN 470
410 IF VS="6" THEN 450 ELSE IF VS="*" THEN 530 ELSE IF VS="-" THEN 550
420 IF VS="9" OR VS="7" THEN 570 ELSE IF VS="L" OR VS="I" THEN 580
430 IF VS=CHR$(32) THEN SCREEN 2:SCREEN 8:COLOR 7,1,1:CLS:END ELSE 390
440 DRW=DRW-1:IF DRW<0 THEN DRW=1:GOTO 390 ELSE 390
450 OX=X-X+1:IF X>160 THEN X=160:GOSUB 590
460 IF DRW THEN GOSUB 278 ELSE GOSUB 328
470 OX=X-X+1:IF X<1 THEN X=1:GOSUB 390
480 IF DRW THEN GOSUB 278 ELSE GOSUB 328
490 OY=Y-Y+1:IF Y<1 THEN Y=1:GOSUB 590
500 IF DRW THEN GOSUB 278 ELSE GOSUB 328
510 OY=Y-Y+1:IF Y>180 THEN Y=180:GOSUB 590
520 IF DRW THEN GOSUB 278 ELSE GOSUB 328
530 C=C+1:IF C>15 THEN C=0
540 IF DRW THEN GOSUB 278 ELSE GOSUB 328
550 C=C-1:IF C<0 THEN C=15
560 IF DRW THEN GOSUB 278 ELSE GOSUB 328
570 VS=INPUT$(1):BSAVE "PIC."*VS*".BIN",0,&H4000:BEEP:GOTO 390
580 VS=INPUT$(1):BLOAD "PIC."*VS*".BIN":GOTO 390
590 SOUND 37,5:RETURN
600 DATA 127,4,100,6,112,7,1,9
```

Figure 2: The LORES.BAS low-resolution drawing program, for color systems only. Run MAPMAKER.BAS first, so that the LRGMEM.MAP memory map is already on your disk.

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the screen; such movement is relatively slow as implemented here.

Both the MAPMAKER and LORES programs can be combined, but it's much faster to create LRGMEM.MAP separately before you run LORES. Remember too that you can't see text in this mode—if you crash, hit Ctrl-Break and then type SCREEN 2. Some very interesting images can be drawn by using adjacent high-intensity and low-intensity colors to create shadow effects.

Controlling Ctrl

I recently worked on a communications package (written in BASIC with assembler subroutines) that was designed for inexperienced users to access a remote database. We did not want users to be able to stop the screen from scrolling or to break out of the program while logged onto the remote system. The solution I devised was to disable the Ctrl key. This prevented a Ctrl-Break

```
100 ' CTRLLOCK.BAS - creates CTRLLOCK.COM file -- by Joe Dörner
110 '
120 DEFINT A-Z
130 GOSUB 250
140 F.OUT$="CTRLLOCK.COM"
150 OPEN F.OUT$ AS #1 LEN=2
160 FIELD #1,2 AS A$
170 PRINT "Creating file ";F.OUT$
180 FOR I=0 TO 105
190 LSET A$=MKI$(VAL("&H"+CTRLLOCK$(I)))
200 PUT #1,I+1
210 NEXT
220 CLOSE
230 PRINT "File ";F.OUT$;" created"
240 END
250 '-----
260 DIM CTRLLOCK$(105)
270 CHECK#=0
280 RESTORE 340
290 FOR N=0 TO 105:READ CTRLLOCK$(N)
300 CHECK#=CHECK#+VAL("&H"+CTRLLOCK$(N)):NEXT
310 READ CHECK2#
311 IF CHECK#<>CHECK2# THEN PRINT "Check DATA statements!":STOP
```

(Figure 3 continues)

Figure 3: The BASIC CTRLLOCK.BAS program that creates CTRLLOCK.COM file to ignore the Ctrl key.

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```

320 RETURN
330
340 DATA EB90, 9044, FBFB, FB90, 61E, 5350, 5251, 5756
350 DATA 8C55, 8ECE, 8EDE, 84C6, A860, 7580, 3C1C, 751D
360 DATA E418, C61, E680, 2461, E67F, B061, E628, 5D20
370 DATA 5E5F, 595A, 585B, 1F07, 5DCP, 5E5F, 595A, 585B
380 DATA 1F07, EA, 0, E00, B01F, B409, CD35, 8B21
390 DATA 4BCB, 264B, 78B, FB3D, 75FB, BA09, 1AA, 9B4
400 DATA 21CD, 20CD, 43BE, 2E01, C89, 8C2E, 244, 6BA
410 DATA B001, B409, CD25, BA21, 186, 9B4, 21CD, 47BA
420 DATA 8301, FC2, 27CD, A0D, 5443, 4C52, 4F4C, 4B43
430 DATA 7020, 6F72, 7267, 6D61, 6E20, 776F, 6920, 736E
440 DATA 6174, 6C6C, 6465, D2E, 240A, D07, 438A, 5254
450 DATA 4C4C, 434F, 204B, 7270, 767E, 6172, 206D, 6C61
460 DATA 6572, 6461, 2079, 6E69, 7473, 6C61, 656C, 2E64
470 DATA A0D, 2407
480 DATA 889362
    
```

(Figure 3 ends)

sequence from halting the program, a Ctrl-NumLock sequence from stopping the program, and even a Ctrl-Alt-Del sequence from rebooting the computer.

I wrote a short assembler language program called CTRLLOCK that attaches to

the keyboard interrupt. [The full assembler listing is available via modem from the PC Interactive Reader Service, (212) 696-0360.—Ed.] The program examines all the keystrokes and ignores every depression of the Ctrl key.

A setup routine is run when CTRLLOCK is first executed. The setup portion checks for a special word located at the front of the program, which would indicate that this program had already been run. If this word is not found the old keyboard interrupt address is saved into a location called OLD_KEY_ADDR. The program then points the interrupt vector at itself and exits requesting DOS to keep itself in memory.

CTRLLOCK is then called whenever a key is pressed or released on the keyboard. All registers are first saved. Then an IN command directs the keyboard to return the scan code of the key being pressed. This code is placed into the AL register. A test is made to determine if the key is being depressed or released. No action is taken for key releases.

If a key is depressed, the AL register is tested to see if the scan code for the Ctrl key is present. If not, an exit to the normal

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keyboard interrupt routine is made. If the Ctrl key has been pressed, then the keyboard is sent some signals, via the OUT command, to cause it to reset and forget that the key was pressed. The registers are all restored and an Interrupt Return is made.

If a different key was pressed or a key was released, a jump is made to the original keyboard routine. All registers must be kept in their original state; so the jump to the keyboard routine is coded directly rather than with a JUMP instruction. CTRLLOCK will work fine in conjunction with *Prokey* or any other program that attaches itself to DOS and looks at key-strokes. CTRLLOCK should be run last, however, after *Prokey* is installed.

You could change the test to look for any other key or multiple keys. One change might be to have it ignore the Esc key. Pressing Esc causes *dBASE II* to break out of command files. Ignoring this key would force a *dBASE* command file to keep executing and prevent an exit to *dBASE* itself.

The CTRLLOCK.BAS BASIC program in Figure 3 creates an executable version of CTRLLOCK called CTRLLOCK.COM. Just key the program in and run it.

Joe Dornier
Temecula, California

CTRLLOCK.COM does disable the Ctrl key (which can be maddening if you're using WordStar) and keeps users from rebooting or stopping the execution of a program. (However, certain programs such as Sidekick override this and restore the Ctrl key's effectiveness, or may have other unpredictable results.) But it comes in handy if you want to prevent other users from breaking out or rebooting.

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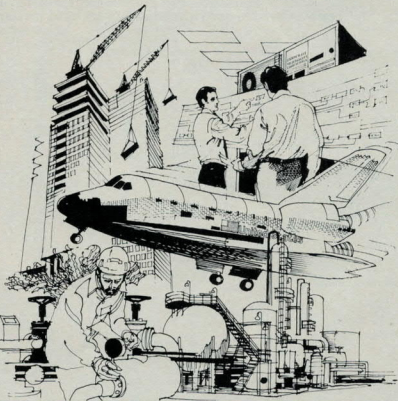
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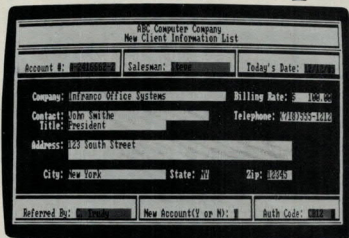
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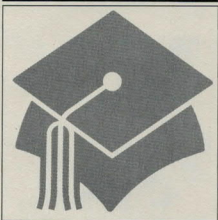
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PC Tutor

Dating Your Documents

Q: Could you tell me of a way to utilize, in document or similar files, the date that is set during bootup or by the DATE command? In BASIC this is easy: DATE\$ gives the date, which can then be used in



files, printouts, and so on. But if BASIC is not on a disk or otherwise accessible, is there any way to make use of DATE to "stamp," say, the printout of a file?

John H. Jackson
Ann Arbor, Michigan

A: What you want to do, I take it, is to create, on demand, a kind of "date stamp" that you could add to a document file. The simplest way is to type in the date yourself. If you want to create a program to do this, perhaps the simplest approach is to use the DOS DATE command with redirected input and output. (This is a good way to learn about redirection even if you don't use the program!)

Consider a line such as:

A>DATE <CARRIAGE> >TODAY

Here, CARRIAGE is a tiny text file that consists of one empty line and a carriage return—to simulate answering the DATE question by pressing the enter key. The < sign before the word CARRIAGE is a redirect symbol that means: use the file CAR-

RIAGE as an input source (instead of the keyboard). You can construct the CARRIAGE file with the COPY command

```
A>COPY CON: CARRIAGE <enter>
<press enter key again>
<press F6 key> <press enter
key>
A>
```

For your application you only need to create CARRIAGE once and then leave it on the disk. Note that the file is only 2 characters long (a carriage return and a Ctrl-Z end-of-file marker), though it may take up 1,024 bytes on your diskette.

The > sign before the word TODAY means that DOS will create a file named TODAY, putting the output of DATE into the file. In current jargon, the output of the program DATE has been "redirected" to the file TODAY.

Having created the CARRIAGE file, when you now type your command

DATE <CARRIAGE> >TODAY

you will find a TODAY file has been created, with the following lines in it:

Current date is Mon 2-25-85

Enter new date (mm-dd-yy):

This is exactly what DOS would have typed on the screen.

You can get a bit fancier and strip off the last line quite easily using the DOS FIND program. It is a DOS program (not an intrinsic command), so FIND.EXE would need to be on the disk. Instead of your previous command line, you type

```
A>DATE <CARRIAGE> FIND
"Current" > TODAY
```

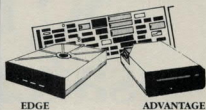
Now the TODAY file will only retain the first line of the DATE result—the line containing the word "Current". This works by piping () the output of DATE to the FIND program. FIND thus uses the output of DATE instead of the keyboard for input. In this case, that looks like two lines of text. FIND notices the word "Current" on line 1 and passes it to the file TODAY. The sec-

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CIRCLE 269 ON READER SERVICE CARD



PC TUTOR

and line has no such word and therefore gets swallowed up.

If you are trying to integrate this with your word processor, I would suggest that you get the startup (AUTOEXEC) routine to run the line that creates the TODAY file. Almost every word processor will let you merge or include an existing file (TODAY) with your current file. Then your printout will always contain a single line saying:

Current date is Mon 2-25-1985—updated, of course, each day. [Editor's note: with my PC-XT, under DOS 2.1, I did not need to use the DOS "pipe," FIND. The "Enter new date" appeared on the screen only (and the carriage return from CARRIAGE popped you past it) and was not transferred to the TODAY file. Use whichever way works for you.]

Equipment Wear and Tear

Q: I am interested in the effects of turning a typical PC configuration—PC, printer, and modem—on and off vs. leaving them running unattended. Assuming the screen is blanked to prevent being burned, is it better to turn the system off or leave it running idle for 1 hour? 8 hours? 24 hours?

Glenn Gilchrist

West Islip, New York

A: If any of our readers have ever seen any hard data on this I would be most interested in passing it along. On the one hand, turn-on/turn-off switching transients (brief power surges) are a prime cause of premature equipment failure, and properly designed transistor equipment, given recommended ventilation, should theoretically be left on continuously. On the other hand, I suspect that most printer motors, for example, are probably not designed for continuous duty—to say nothing, of course, of your local cost for electricity.

My best guess would be that the break-even point is probably somewhere between 8 and 24 hours. That is to say, if you're leaving for less than 8 hours, it would probably be best overall to leave the system on. More than a 24-hour absence would almost certainly imply turning the system off, though some would make a case even here for leaving the system running all the time.

However, I'm inclined to think that the break-even point would be less than 8

hours if you have a fixed disk, for its motor turns continually when the power is on.

Reducing Disk Access Time

Q: I own an IBM PC with two floppy disk drives using DOS 2.1. I have recently started using a program called FASTDISK, which, by changing the IBM parameters, decreases access time by over 30 percent. The drives seem, if anything, to operate more quietly with less audible strain. Are there any hidden drawbacks to using such a program?

Bob Unferth

Wilmette, Illinois

A: When the IBM PC first came out (with DOS 1.0) IBM—and everyone else—found that it had severely underestimated the access speed at which its disk drives would operate reliably. Thus, a number of speed-up programs such as the one you describe were produced independently. IBM made its own fix in DOS 1.1, so that its drives ran more quickly and quietly.

As you note, the advantage of a program like FASTDISK is a still-greater increase in access speed, together with reduced noise levels. The disadvantage has to do with reliability. The faster you step a head, the more inertia it builds up during seeks. This means it takes the head longer to settle down once it has reached its intended position, and this can result in "bad sector" error reports. This should be most notable when the head is made to travel the longest distance, that is, between inner and outer tracks. I would suggest, therefore, that you try dramatically filling up a floppy to ensure the head has far to travel. Then execute a disk-intensive operation, such as creating a subdirectory on another drive and copying everything over to it. If the drive with the full floppy can cope with the rapid back-and-forth movement of its head, then you're safe in continuing to use FASTDISK to increase the access speed. Although it is possible (and expensive) to burn out motors in disk drives, I don't believe the FASTDISK program will introduce much in the way of additional wear and tear.

Displaywriter and the PC

Benjamin F. Herman, Jr., of Midlothian, Virginia, sends this report (see PC Volume



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PC TUTOR

4 Number 2 and Volume 3 Number 15) about connecting PCs to IBM 5218 Displaywriter printers:

"My local IBM sales representative confirmed the existence of a \$220 5218 Printer Attachment Convenience Pac but added that it can only be used with 5218 models A03 and A04 ordered after April 3, 1984. This is when IBM began adding a modification known as feature code 9203 to all new 5218 printers. Earlier printers

Although the Enhanced Graphics Adapter (EGA)

card is quite sophisticated and is a good emulator, it can only emulate the IBM Color card on a color video monitor.

and models A01 and A02 reportedly will not work with this Pac.

"Anyone in doubt about exactly when his printer was produced should examine the Machine History printout that came with it. This printout will include the purchase date and should show feature code 9203 somewhere near the SALES MOD field if the necessary modification was made. . . .

"Note also that IBM sells 5218 printers specifically configured for the PC. These speak ASCII to the PC, whereas the standard models speak EBCDIC."

Graphics Not Enhanced

Q: Based on favorable reviews of IBM's new Enhanced Graphics Adapter that appeared in PC Magazine as well as other places, I purchased eight of the boards for our department. My original intention was to use them with a monochrome display. Now I find out that not even the simplest graphics programs will run on this hardware combination. I realized that there would be compatibility problems for programs that took short cuts and did not use the standard operating system calls, but even using the Advanced Basic interpreter version 3.0 or the sample programs that come with DOS 2.1, it is not possible to

use the graphics capability of the board.

No doubt sometime in the future there will be upgrades of popular programs that will support this hardware, but in the meantime I must try to solve this problem. Can you tell me enough about either the video buffer for the board or the correct operating system calls so that I can build my own Pascal procedures to access the graphics capability?

Vic Mansfield
Hamilton, New York

A: Although the Enhanced Graphics Adapter (EGA) card is quite sophisticated and is a good emulator, it can only emulate the IBM Color Card on a color (or composite) video monitor. When used with the IBM monochrome monitor, the EGA board provides 640 × 350 resolution, while the (old) IBM color card has a maximum of 640 × 200 resolution. Thus, unless you write a special device driver (the type, for example, that allows Lotus's 1-2-3 to run on the Hercules monochrome card), software for the two cards will not be at all compatible with your monitor setup.

For what it is worth, however, when run with a monochrome monitor, the EGA card does support a new video mode (F hex). To initialize the card for these graphics, you need to load the AX register with 000F hex and perform an interrupt number 10 hex. To reset for the character display, set the system to mode 7 (AX=0007, int 10 hex).

The memory map is straightforward. The EGA board is based at segment A000 hex (absolute address A0000). Each scan line (350 total) takes up 80 bytes of memory (one byte per 8 pixels, just like the 640 × 200 color card). Scan lines are arranged linearly, so that scan line 100 would be at offset 8000—80 characters per line times 100 lines (all decimal).

The high-resolution color modes of the EGA card are totally unlike the IBM Color Card, so you're not alone in waiting for software to take advantage of them.

The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016. ■



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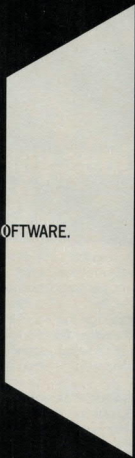
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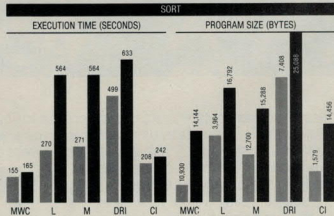
many others have made MWC86 their compiler of choice. (After all, they're only human.)

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NOTE: Sort program as in Byte, August 1983, p. 91. Register declaration added. Further information on these benchmarks available from Mark Williams Company upon request.

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Scientific Word Processing

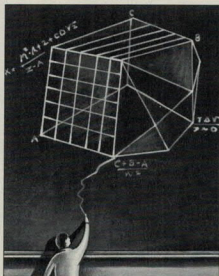
A good scientific word processor should have many of the same functions as a good general word processor, and then some. WordMARC, a venerable science program, comes close to the ideal.

The ingredients of a successful scientific word processor are in some respects the same as those of a successful business word processor. Scientists and businesspeople both want a word processor that is easy, responsive, and powerful. After all, text is text. However, most scientists would be best served by specialized word processors that meet their special needs, which include the following:

Formulas. Scientists must quantify and clarify and, in most branches of science, that means equations. A good word processor for the scientist should provide facilities for entering equations and for defining and using special symbols.

Tables. One of the elements most common to journal articles is a tabular presentation of results. A simple text processor is inadequate for the studious composing and rearranging required to present data neatly in a table.

Footnotes. Most scientific journal articles are stuffed with references, and a good scientific word processor should make provisions for them. A system that looks up citations in a database would be



ideal, but a word processor that can automatically place footnotes is a good alternative.

A package that can handle it all—routine chores, equations, tables, and footnotes—may not even exist. In this column, I'll examine how one program, WordMARC, does in fulfilling my wish list.

An Old Reliable

WordMARC from MARC Software International is one of the most venerable scientific word processors. MARC Software International was founded in 1970 to develop finite element analysis software for engineers. In 1980, it started selling a powerful word processor called MUSE for the DEC line of minicomputers. Eventually MUSE was renamed WordMARC and ported to numerous sys-

tems, including the PC. Thus, WordMARC comes from a scientific software house, and it has been tested and used far longer than most current word processors for the PC.

WordMARC has more than an impeccable pedigree; it also has an aristocratic price of \$495. Respectable word processors are available for under \$100, and truly excellent word processors are available for under \$200. WordMARC, however, is a powerful tool—it commands a steep premium because it delivers a bit more torque than the competition.

MARC Software offers hot-line support for \$50 per year. This seems steep to me—I think that purchasing a \$495 word processor should entitle you to free support for a year. (The company does give a price concession in the educational market with a 20 percent discount to schools and universities.)

Mini/Micro Similarities

One obvious motive for using WordMARC on your PC is that you already have access to it on a mini. The versions are almost identical, and you will be able to switch back and forth easily. In fact, the documentation that I reviewed for the PC version is the same (except for the installation section) as the manual for the mini version. A PC-specific manual is in the works.

WordMARC is a menu-driven, extremely full-featured, easy-to-use word processor. Its do-it-all nature makes it seem bulky, but that's the price you pay for a system that does this much. WordMARC requires 256K RAM, and the pro-



WordMARC

MARC Software International, Inc.
260 Sheridan Ave.
Palo Alto, CA 94306
(415) 326-1971
List Price: \$495

Requires: 256K RAM for DOS 2.x,
320K RAM for DOS 3.

CIRCLE 794 ON READER SERVICE CARD

gram and associated files consume most of a 360K floppy. *WordMARC* nicely supports DOS pathnames, and it works best on a hard disk system.

Simple use of the system doesn't require any special work, but accessing its Greek and math character set requires special installation. The installation section of the manual is 30 pages long, and you must also peruse the 40-page "Alternate Character Guide" if you want to process equations. I thought I could get away with skipping part of the installation process, but I discovered that I had to go through it from the beginning in order to access the Greek and Math symbols.

Greek/Math Symbols

WordMARC's Greek/Math symbol set is impressive, but it's not a substitute for typeset equations. The math symbols include integrals, sums, large braces, the not-equal sign, and plus/minus sign. Though *WordMARC*'s Greek/Math character set puts this system ahead of the others for scientific applications, the missing feature is the ability to control the sizes of the characters. Without the availability of various point sizes, it's impossible to adequately enter most mathematical formulas.

You can edit *WordMARC*'s Greek/Math character set or you can create your own font. This flexibility is important for those who use unusual notation in their documents. Although *WordMARC* supports a wide range of printers, fonts that you design yourself can only be printed on an IBM Graphics Printer, an Epson FX-80 or FX-100, or an Okidata 92.

WordMARC also supports the special math printwheels of four daisywheel printers: Diablo 630 ECS, NEC Spinwriter, DEC LA100, and Qume Twintrack. Other daisywheel printers are supported for normal operations.

Subscripts and Tables

Each line in a *WordMARC* document can have up to six levels of superscripts and six levels of subscripts. You enter an equation by simply painting it on the screen, using the super and sub keys to move up and down. This keeps all of the levels of an equation on one line. If

you're in physics or math, however, you'll still need to enter complex equations by hand or send your work out to a printer.

WordMARC excels at managing data tables. The program uses ruler lines to format a region of text. You adjust the rulers to set tabs, margins, and so on. To enter a table, all you need to do is set up a ruler line with appropriate tabs. If you've made one column too narrow or too wide, you can adjust the tabs on the ruler line.

An even fancier feature enables you to

Aside from its lack of
footnote support,
WordMARC has most
standard word processing
features.

cut and paste columns of text so that you can rearrange the order of columns in a table after you've entered them.

WordMARC has decimal tabs for making numbers line up at the decimal point. The tabular-entry features would be complete if *WordMARC* offered centering tabs and right-adjusting tabs. Until it does, you'll have to be satisfied with left-aligned or numeric columns.

No Footnotes

References are an important part of most scientific papers, and you'd expect a word processor from a science software house to have footnoting capabilities. Sorry, no footnote support here. The only semblance of footnote support is the meager ability to place a superscript number in text. You'll have to settle for endnotes or else set aside space on each page and hope that nothing changes.

Aside from the lack of footnote support, *WordMARC* has most standard word processing features. It includes a spelling checker, a document encrypter, a choice of seven languages for the program's prompts, full file management from within the program, control of page headers and footers, ruler lines to control format, and support for about 70 printers. Even with such a host of features, this package is easy to use.

Now for the drawbacks. First, *WordMARC* won't scroll to an arbitrary point in your document. Each document is divided into pages, and each page is divided into screens. If the paragraph or table that you want to examine happens to straddle a screen boundary, you won't be able to view the whole thing at once. If you compose at the keyboard, this lack of single-line scrolling is a big problem.

Insert Problems

Another quibble is with *WordMARC*'s insert capability. If you move the cursor to some point in your text and start to type, you will overtype the information that's already there. In *WordMARC*, you access the insert mode by hitting the Ins key. The right-hand part of the line will be erased, and you are free to type. When your insertion is done, you must hit Ins again to recall the end of the line and fix up the bottom of the paragraph. My preference is to make insertion the rule, and overtype the exception.

WordMARC's documentation is well written, handsomely printed, well organized, and complete. The two major parts of the documentation are the *Self Teaching Guide* and the *User Guide*. The *Self Teaching Guide* contains 22 easy lessons. Unfortunately, it lacks an index.

The 156-page *User Guide* is organized topically—it's easy to find information, and I was able to use the package effectively by occasionally referring to the manual instead of reading it from cover to cover. The *User Guide*'s table of contents (and introduction) mentioned three appendixes, which were missing in my copy. The index contains only 140 citations—it is even shorter than the table of contents. The *WordMARC* package also contains a key reference chart, a quick reference folder, and a fold-out chart of the Greek and Math symbols. The system is supplied on five diskettes.

WordMARC has a very distinctive style. The menus, commands, and manual combine to give this package a very luxurious feel, which may sometimes get in the way. It may not be a scientist's dream, but overall it is an excellent package, and its unusual equation- and table-handling abilities make it stand out in the word processing crowd. ■

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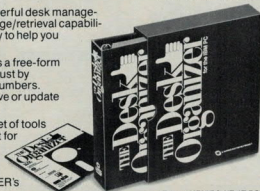
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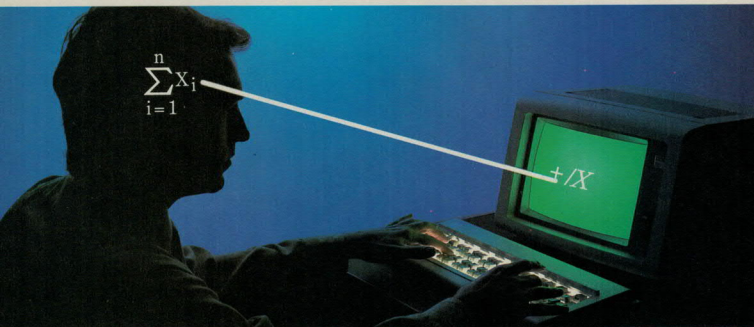
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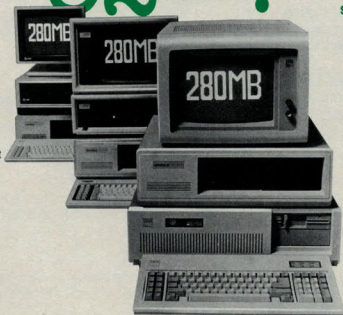
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Successful Investing: Seizing the Moment

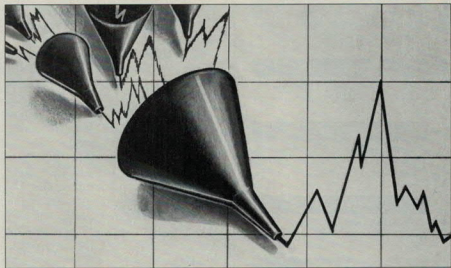
"Buy low, sell high" is good advice, but how can you pinpoint the right moment? TechniFilter's sophisticated approach to this question may set the standard by which other programs will be judged.

Suppose you have collected 500 charts of the price and volume performance of as many stocks, each plotted over the span of the past year. By scanning every single page you might identify ten stocks whose smoothed price curve has just turned from downtrend to uptrend, or from uptrend to downtrend. You could then put aside the other 490 charts and concentrate on just these ten technically interesting stocks, with the hope of buying low and selling high.

If we attacked the job in the traditional way, it would be necessary to actually examine and interpret 500 paper charts, most of which would require some laborious pencilwork to analyze.

You can computerize the graphing and sorting, using any of several programs that support technical analysis. Notable among them are Anidata's *Market Analyst*, Savant's *Technical Investor*, SUMMA's *Winning on Wall Street*, The Dow Jones Market Analyzer, and R&D Software's *Wall Street Window*.

These programs will download from



commercial databases the numbers you need to recreate the hypothetical 500 charts on your PC screen.

But, as with sorting by hand, you must still spend time, on paper or on the computer screen, preparing experimental moving averages, tentative trendlines, and other lines of definition and demarcation in order to make your final choice of ten stocks.

Comparison Shopping

The ideal technical analysis program would enable you to forgo drawing analysis lines on the chart. It would use your PC's ability to calculate directly from the numbers rather than from the charts and would make all the objective and quantitative cuts so as to display only the final ten charts, speeding up the sorting process tremendously.

Some of the programs mentioned above include modules that can take this extra step for you—Anidata's *Market Analyst*, for example, is an integrated portfolio management package that includes a presort module.

TechniFilter by RTR Software, Inc., however, is a new program designed specifically to help you presort charts and apply technical analysis strategies, and as such it is a good example of how these dedicated programs work. In addition, *TechniFilter* includes a few extras that make it a standard by which to judge similar programs. For example, *TechniFilter* is a bit handier to use than *Market Analyst* because it has 48 pages of documentation to *Market Analyst*'s 2 pages.

Like any product, *TechniFilter* has its limitations. The first is its price. At \$299, this dedicated package sells for

FACT FILE

TechniFilter

RTR Software, Inc.
444 Executive Center Blvd., #225
El Paso, TX 79902
(915) 544-4397

List Price: \$299

Requires: 128K RAM and two drives, or PC-XT; DOS 2.0. Operates only on files generated with *The Dow Jones Market Analyzer* program.

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FINANCE

nearly two-thirds the price of *Market Analyst*, which is a complete, integrated package with a database. Actually, *TechniFilter* also has one severe practical limitation at the moment: It operates only on files created with *The Dow Jones Market Analyzer*, which RTR also wrote.

How It Works

TechniFilter works in two steps. First, it calculates and files values—such as today's close, or the current values of simple moving averages and/or exponential moving averages taken over several intervals (for instance, 6, 10, 12, 24, 30, or 200 days) for each stock in the system. Five hundred stocks is the upper limit.

Once these values have been calculated, *TechniFilter* can use them as the basis for a conditional screening. This second step is the "filter" of *TechniFilter*. For example, the analyst might request a list of all stocks for which the day's closing price lies above the 30-day moving average closing price. If 100 stocks met this condition, he might then stipulate a subset of stocks for which the 30-day moving average exceeds the 200-day moving average—a condition that many investors believe indicates clear sailing ahead. *TechniFilter* can also link these two conditions with a logical AND so that the screening could be accomplished in a single pass.

To help you set up the screening process, *TechniFilter* also provides a master list of 48 formulas, accessible via the programs menu. The list is a catalog of questions that can be used to construct the criteria for the screening passes. Most of the questions are comparative statements that enable you to ask, for example, if today's closing price is higher or lower than yesterday's, or if the on-balance volume is rising or falling.

Simplified Computations

TechniFilter's underlying mathematics are nicely hidden from view. To calculate the slope of a least-squares fit to a linear regression for 10 days of volume data for a given stock, you would just select or write the formula VW10, where V stands for volume and W is the designation for least-squares fit. To learn how this value compares with the same value

as it would have been reported yesterday, you would write VW10Y1, where Y1 = yesterday. I found the notation easy to learn: much of it is mnemonic or can be associated with shapes you can see on a graph: a straight line tending up, a peak, a valley, a saucer, a point sitting above or below a line.

Criteria to Watch

The combination of standard formulas and conditions enables *TechniFilter* to seek out stocks on the basis of five types of criteria: Reversal tests (has the stock price changed direction?), crossover alerts (has the stock's 10-day moving average risen above its 30-day moving average, and so forth?), tests of position within a range (has the stock broken out of its characteristic trading range? Is it approaching, to within some stipulated percentage of the range, its historic high or low?), volatility (how fast does the stock move? How frequently does it ricochet back and forth within its trading range?), and measures of position and trend (where is the stock relative to its 5-day simple moving average line? Where is the 12-day exponential average relative to the 12-day simple average?).

You can't use all 48 model formulas in a single screening operation. Instead, the user makes a selection of several formulas or writes his own, and then sets the conditions to be met by the results calculated using these formulas. If formula 1 is a calculation of the 10-day moving average and formula 2 is a calculation of a 30-day moving average, a typical condition might be set to require that the result of formula 1 must exceed that of formula 2 for the chart to be considered acceptable.

TechniFilter provides seven preset formula sets that have conditions already established as "examples." These examples, which are in fact capsule programs that will select stocks for you, can be run right out of the box or customized to meet your own technical criteria.

At the conclusion of the filtering process, *TechniFilter* produces a short list of stocks that meet the chosen criteria. You can then use one of the technical analysis graphics programs to graph these stocks and scrutinize their charts in detail.

Testing Buy/Sell Strategies

Once you have chosen a stock, *TechniFilter's* Optimizer allows you to test different buy/sell strategies to learn what would or would not have worked for this stock in the past. Thus you can devise a unique strategy for each of the stocks you trade. This is important because it allows you to test strategies with complex computations that would be nearly impossible to do by hand.

A typical strategy might stipulate, for example, that you always buy a stock whenever its 10-day moving average rises above the 30-day moving average, and that you always sell short when the 10-day moving average falls back below the 30-day moving average. The program will examine the price history of the stock, keep track of the mock transactions executed with your strategy, and report your net percentage gain or loss as of the most current close.

TechniFilter will also report the results obtained by simply buying at the price recorded for the first day on file and selling at the last close. *TechniFilter* can automatically vary and test several dif-

The Optimizer allows you to test different buy/sell strategies with complex calculations that would be nearly impossible to do by hand.

ferent terms of the moving averages to discover the best strategy.

TechniFilter's Optimizer, however, is not as highly automated as it might be. It would be interesting to see the Optimizer teamed with a built-in number generator so that you could test a strategy

under a very wide range of conditions without typing in reams of numbers. Such testing, however, might take a few days.

It would also be nice if *TechniFilter* let you experimentally vary the term over which the strategy is tested. It is my own view that when these strategies do work, it is purely fortuitous—they just happen to work. There are no underlying principles to name, grasp, and use. The thing to be grasped and used is the moment (or the day, or the weeks, or even months) during which the strategy succeeds.

TechniFilter might or might not help you seize these profitable moments, but there is no question that it can improve the quality of the time you spend doing technical analysis. ■

Michael Gianturco is editor of High Technology Investments, an advisory letter published in Houston.

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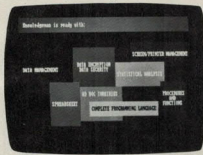
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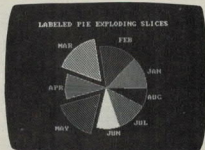
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Now this discovery posed a dilemma: how to cut the price of diskettes without lowering the quality.

There are about 85 companies claiming to be "diskette" manufacturers.

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The new Eastman Kodak diskettes, for example, are one of these. So are IBM 5 1/4" diskettes. Same for DYSAN, Polaroid and many, many other familiar diskette brand names. Each of these diskettes is manufactured in whole or in part by another company!

So, we decided to act just like the big guys. That's how we would cut diskette prices...without lowering the quality.

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We found that there are several manufacturers who don't give a hoot about the consumer market for their diskettes. They don't spend millions of dollars in advertising trying to get you, the computer user, to use their diskettes.

Instead, they concentrate their efforts on turning out the highest quality diskettes they can...because they sell them to the software publishers, computer manufacturers and other folks who (in turn) put their name on them...and sell them for much higher prices to you!

After all, when a software publisher or computer manufacturer or diskette marketer puts their name on a diskette, they want it to work time after time, everytime. (Especially software publishers who have the nasty habit of copy-protecting their originals!)

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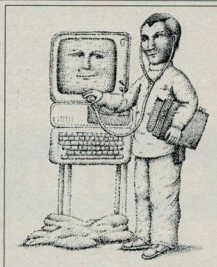
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CME, Inc., has created a software series that can simulate clinical experiences in order to help physicians learn about or enhance their knowledge of a particular condition.

CME is an independent entity created by the School of Medicine at the University of Washington in Seattle to produce, market, and distribute computerized medical education materials. Its programs reflect 10 years of experience in the design and use of computer-aided instructional materials. While the company's board of directors includes physicians, its executives come from the business and computer worlds.

Each program simulates an encounter with a patient who suffers from specific



Abdominal Cramping at 29 Weeks' Gestation, Cardio-Pulmonary Life Support Case Simulation, Recurrent Otitis Media in a 17-Month-Old Child, A Painful Foot in a 42-Year-Old Man, Diarrhea and Vomiting in an Infant, and Chest Pain in a 30-Year-Old Man.

Approximating Reality

I reviewed six of the simulations available. Each case begins with a short introductory screen with easy-to-follow instructions. A short history of the patient's illness follows.

This is followed by a screen that asks you to prescribe a treatment or request more information through an extensive series of branching menus, which include further history, physical findings, laboratory data, and investigational procedures.

When probing for further history, the program sometimes forces you to be so specific in your menu choices that you feel almost as if you were dealing with a real patient, except for the unrealistic brevity and accuracy of the "patient's" answers. The programs answer both appropriate and inappropriate questions, but responses to the appropriate questions include explanations of why the question was valuable, whether or not the answer gave a positive clue to the problem at hand.

The simulated results of a particular lab test are not always immediately available. Instead, as in the real world, you have to wait a realistic period of time (simulated, to be sure) before receiving an answer. In the meantime, you have to

complaints. When using the program, you identify and treat the medical problem presented, much as you might in a real encounter with a patient. You can learn from mistakes in this setting without harming a patient or risking a malpractice suit.

Twelve simulations are currently available; the company is producing additional cases every few months. Each case is counted as 2 Category-1 hours of continuing medical education credit by the AMA and the AAFP (American Academy of Family Physicians).

The titles available as of this writing are: *Lower Abdominal Pain in a Young Girl, Fatigue and Fever in a 38-Year-Old Man, Dysuria in a Young Woman, A Case of Acute Bloody Diarrhea, Respiratory Infection in a 62-Year-Old Woman, High Fever in a 7-Month-Old Child,*

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prescribe treatment based on what you already know. When lab results do come in, you may use the information obtained and modify treatment as indicated.

The programs also provide an option for investigational procedures. If a test is inappropriate, the program sometimes provides the results, but it always explains why the test is inappropriate.

An unexpected complication from a procedure can occur in the program, just as it might in practice. Consequently, you must be alert for a new finding that is a complication of therapy rather than part of the original problem, and you must be prepared to deal with both.

In response to the treatment you designate, the program often indicates the treatment's urgency or need and its value: positive, neutral, or negative. The case then proceeds according to the results of treatment. If you choose several selections from the menu without select-

ing all of the most appropriate choices, the program hints what your next selection should be.

End-of-Session Followup

When the session is over, you are given a score that you can compare to the

Whether or not you
agree with the
author's treatment, the
simulations make you think.

scores of others who used the program at the University of Washington. You also receive a password that gives you access to a "teaching" section at any point in the program if you want to go through it again. (A teaching section consists of a concise but complete summary of the illness, its diagnosis and treatment, and

several pertinent references to the clinical literature.)

Finally, the program produces a code that can be returned to CME to obtain credit for completing the program. I assume the code contains the user's score and program name in encrypted form.

The quality of the programs varies somewhat; each contains a few points I might dispute. I don't think you can accept the care recommended in any of these programs as the single best way to deal with a patient.

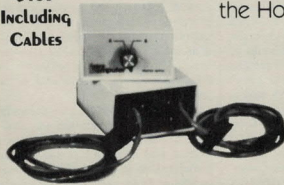
One Case History

My specialty is pulmonary diseases, so as an example, I'll discuss the case, *Respiratory Infection in a 62-Year-Old Woman*. The problem concerns a 62-year-old female smoker, allergic to penicillin and afflicted with heart disease, though this is apparently unknown to her. The woman develops a secondary bacterial infection

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complicating a viral syndrome.

In real life, a doctor might easily treat such a patient at home with an oral antibiotic if the illness weren't too severe. In this case, the "correct" answer is to admit the patient to the hospital.

The instinct for sensing the severity of an illness that a doctor develops in medical training is important in this situation. The description of the patient, in this case and others, is not complete enough to allow you to sense the severity of the illness easily—something an experienced physician can often size up at a glance. This inadequacy might be considered a flaw of simulations in general.

As it turns out, the patient has a staphylococcal infection that requires special antibiotic therapy. Of the drugs offered for treatment, two are appropriate. Cephalixin is one of them. But 5 to 10 percent of penicillin-allergic patients are also allergic to this drug. If you choose it,

the "patient" suffers a severe allergic reaction and nearly dies.

In the program, the patient exhibits the allergic reaction every time the drug is chosen. Since this reaction occurs only 5 to 10 percent of the time in practice, the program should have simulated the reaction with the same frequency.

Finally, the patient has collected fluid in her chest cavity. The program insists that you insert a large tube into her chest to drain the fluid. Though this procedure might be necessary in practice, it would be prudent to first withdraw some of the fluid with a small needle to determine its nature. In real practice, not all collections of fluid in the chest require surgical procedures to resolve. The teaching value of the program would have been enhanced by discussing when such a procedure is indicated.

The program I've described was the weakest of those I reviewed. Despite my

negative comments, I enjoyed working with the programs. They were fun, in the way that medicine is supposed to be fun. Whether or not you agree with the author's treatment, the simulations make you think.

From Teaching to Authoring

The structure of the series seems to be a skeleton program with data files containing the appropriate information for each case. If CME were willing to provide a program to create these data files, it would make an excellent authoring system that could be used to develop medical simulations for teaching. I'm sure many medical educators and institutions would be interested in purchasing the development system to create simulations of their own choosing. ■

Bernard Friedman is a frequent contributor to PC.

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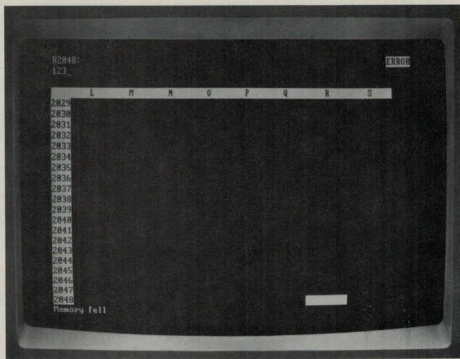
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Lotus 1-2-3 claims a spreadsheet capacity of 256 columns by 2048 rows. Unfortunately, its actual capacity often turns out to be much less, because memory is wasted on empty cells.

That's the case in the screen on the left,* where all unused cells between column R(18) and row 248

are needlessly allocated while trying to enter only one number, filling memory completely.

The Smart Spreadsheet, on the other hand, has a unique space-saving feature called "sparse matrix," which prevents such a calamity from occurring.

That's because Smart

allocates space for only those cells which are filled, not those that are empty.

And Smart's "virtual memory" design takes its capacity one step further. It means that the size of a spreadsheet is not limited by a computer's RAM (as it is with Lotus 1-2-3), but by disk space alone. It's like having

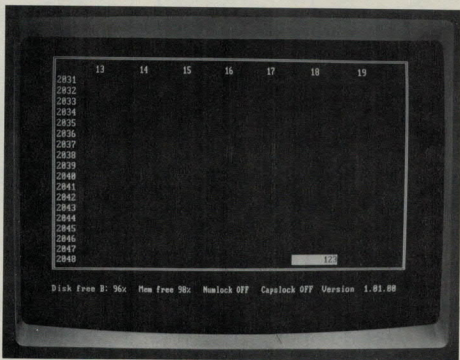
thousands of additional cells of memory on reserve.

These features, coupled with Smart's enormous capacity for 999 columns by 9,999 rows, make it the largest spreadsheet available.

But The Smart Spreadsheet's unequalled power and capacity are only part

*The screens shown above are actual representations of Lotus 1-2-3 and The Smart Spreadsheet as they appear when used on a standard IBM PC with 256K RAM.

Smart.



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*Smart does not allocate memory to empty cells,
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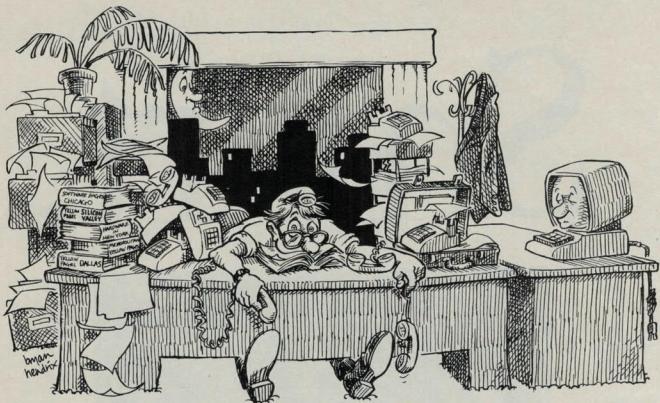
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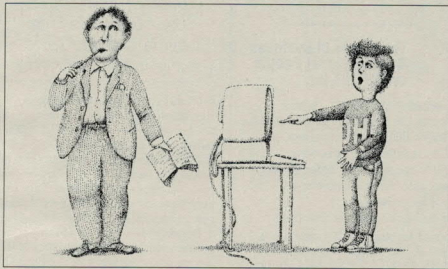


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Computerized Classroom Visions

Will the use of computers in school affect children adversely? An experienced educator says no; computers can instead enhance classroom creativity and human interaction.



Will children who spend an appreciable amount of their school time using computers turn into asocial nerds or computer zombies? Some educators and commentators think so. And it could happen if computers are dumped willy-nilly into the schools in the manner of past educational fads. In the January 1985 issue of *Whole Earth Review*, "Jerry Mander," an advertising executive, asserts, "As computers replace teachers—which will certainly happen more and more—the certainty of computer programs will replace the subtlety of human student-teacher interaction."

If you grant that Mander's rather questionable assertions are reasonable predictions you might ask, How should society avoid turning kids into extensions of the computer? How should the schools en-

hance, not diminish, the human values of the classroom?

In the first place, a computer on every desk is neither necessary nor desirable. Ranks of children keyboarding in unison in the manner of a typing class is a depressing vision that would prove an educationally counterproductive reality, one ultimately yielding the lockstep automations that Mander fears.

A look at what now goes on in many noncomputerized classrooms, however, might surprise those with romantic notions about traditional educational practices. The pressures to conform are intense and virtually irresistible. Typically, everybody is doing the same thing the same way at the same time, and heaven help the "deviants."

Far from replacing the teacher, classroom computers can increase the impor-

ance of the teacher in the educational process. The teacher I speak of, however, must be trained to exploit the potential of the computer as well as the child's potential for learning.

Computer Newspapers

In practical terms, the teacher must be able to help the class devise complex projects in which computers can play multifaceted roles as textbooks, design systems, modeling systems, and research tools. Such projects would not be lockstep regimens, but cooperative ventures. Computers are brought into play when needed, then set aside when appropriate.

The class newspaper exemplifies the kind of popular activity that has long been a staple in many schools. It certainly doesn't take a computer to put one out, but given computers, it can become a splendid enterprise. The computer-enhanced approach to this project should allow for a full range of newspaper-related activities, with detailed discussions at appropriate points along the way.

The newspaper staff (the class at large) needs to think about the nature of reporting, separation of fact and opinion, possible structures for a piece of writing, the mechanics of writing, rhetoric, typography, layout, and the many other matters associated with good journalism.

Throughout, the computers repay their cost in the same way they do at a real newspaper—by acting as word processors, typesetters, and data manipulators. And as the students use computers in these roles, they gain practical computer

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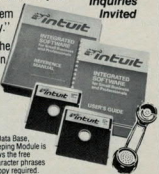
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EDUCATION

fluency without suffering through make-believe, boring little exercises. They instead experience the real thing on a scale suitable to the circumstances.

The educational ramifications of the newspaper project are many, for a newspaper not only encapsulates its culture, but its production demands a variety of

Dull teachers will do dull things with the tools given to them. But why not expect humane and creative teachers to use computers to do humane and creative things in the classroom?

skills and crafts. From writing news stories, editorials, and advertisements, it is a short step to any other kind of writing the teacher wishes to explore.

All the ancillary goodies that can be added to a bare-bones word processing program can be brought effectively into play: style and spelling checkers, thesauruses, indexers, and the like.

Because a newspaper is a business, the number-manipulating capabilities of the electronic spreadsheet can also be put to use. The class must think about advertising and sales revenues, as well as production and other costs. Of course, the teacher must know something about how to use an electronic spreadsheet. But that, too, can be a cooperative learning experience in which the class—like any other organized group of people—attempts to solve a problem together.

The thrust of my argument against Mander's dismal picture of the computer-tyrannized classroom is clear. Dull teachers will do dull things with the tools given to them. Tyrannical teachers will do tyrannical things. But why not expect humane and creative teachers to use computers to do humane and creative things in the classroom?

Computer-Enhanced Interaction

Let's return to the question of the "subtlety of human student-teacher in-

teraction." What exactly is this "subtlety"? Mander doesn't tell us. I understand it as emotional connections between students and teachers. The computer does not necessarily detract from these relationships and can contribute to them. A computer-enhanced project such as the theoretical school newspaper I described certainly affords many possibilities for positive interactions.

Certainties?

Mander's notion of the "certainty of computer programs" is illusory or meaningless. Yes, it is certain that a given key will move the cursor to the right one space and that another key will move the cursor to the left one space. So what? How does this kind of certainty interfere with anything that is educationally valuable? Not all programs are based on cer-

Not all programs are based on certainties. Indeed, all well-designed problem-solving software allows for the open-endedness that creative thinking demands.

tainities. Decision-making software, for example, uses the concept of weighted choice. Indeed, all well-designed problem-solving software allows for the open-endedness that creative, productive thinking demands.

Spreadsheet templates are a good example. Template design should be a cooperative exercise in which assumptions are constantly tested and design errors rectified in a brainstorming session. The computer's ability to rapidly visualize the abstract opens for the child new intellectual landscapes. The "certainty" that worries Mander doesn't exist in a meaningful way.

None of Mander's basic points—the

Henry F. Beechhold is a professor of English and chairman of the Linguistics Department at Trenton State College and the author of three books on computers in education.

child as computer zombie, the loss of student-teacher interaction, and the certainty of computer programs—has demonstrable substance. I realize that his essay is meant to be cautionary, not

necessarily predictive, but such cautions tend to fuel the fires of antitechnologists and impede progress. Let society therefore be cautious in its response to cautions. ■

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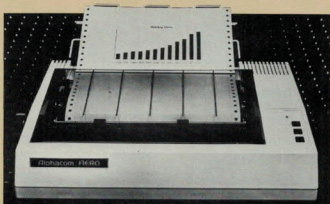
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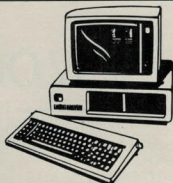
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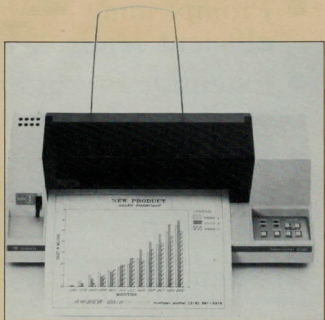
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Colorwriter 6120, Gould, Inc., Recording Systems Div.

The Colorwriter 6120

A seven-pen, general-purpose plotter with both RS-232 serial and Centronics parallel interfaces. Designed around HPGL-based firmware, the Colorwriter 6120 is compatible with a range of graphics software and other programs such as Lotus's 1-2-3, SuperCalc3, and Framework.

Features of the plotter include a resolution of 0.002 inches, a plotting speed of up to 7.8 inches per second, front panel controls for Pause, Reset, and Scale, and paper selection for 8 x 11 inches, 11 x 11 inches, and A3 or A4 sizes. (List Price: \$895) Gould, Inc.

Recording Systems Div.
3631 Perkins Ave.
Cleveland, OH 44114
(216) 361-3315

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New Apparat Boards

Three new boards extending the features of the PC, Portable, XT, and AT.

The new additions to the Apparat line include:

- **AT Combo Card**—Adds up to 3 megabytes of RAM to the IBM PC AT, with parity checking and split memory addressing. The card is expandable from 128K and can accept either 128K or 256K chips.

Other features include serial and parallel ports and a print-spooling utility.

- **28-Pin PROM BLASTER**—A board capable of programming 28-pin EPROM chips, including the 2764, 2764A, 27128, 27128A, and 27256. The card's firmware is menu-driven and has an edit function for its built-in data buffer. The firmware also performs checksum routines and can read the contents of existing EPROM memories

into its data buffer.

- **RAM/Clock**—Add-on memory from 64K to 384K, depending on the number of banks and the starting address of the RAM array. Included software runs the clock/calendar and provides for both a RAMdisk and a print buffer.

(List Price: 128K AT Combo Card, \$449; 28-Pin PROM BLASTER, \$129; 64K RAM/Clock, \$199)
Apparat, Inc.
4401 S. Tamarac Pkwy.
Denver, CO 80237
(800) 525-7674
(303) 741-1778

CIRCLE 781 ON
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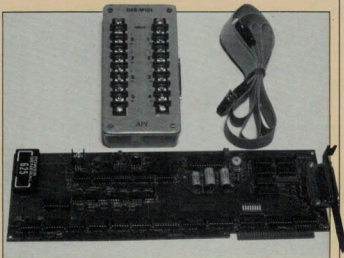
MIDAS (Modular Instrumentation Data Acquisition System)

A data acquisition and instrument control system capable of measuring temperature, pressure, DC/AC voltages

and currents, and various types of digital signals. It can control external devices through relays, D/A converters, solid-state switches and power controls, or TTL signals.

The MIDAS system centers around a control adapter that plugs into any slot of a PC, with connections for up to 16 external input/output modules. External modules available for the system include an 8-channel thermocouple in, an 8-channel, 4 to 20 milliamp in with loop power, a digital out, and an expander/repeater unit. Modules can be up to 300 feet away from the PC, permitting the units to be placed in environments hostile to the user's system.

Available software support for the MIDAS system includes a PC-DOS device driver, several applications programs, and custom software development aids.



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CIRCLE 776 ON
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Echo PC₂

A speech synthesizer board featuring two modes of operation: a limited vocabulary in a natural-sounding female voice, and an unlimited vocabulary in a robotic-sounding voice.

In the human-voice mode, the half-size card can produce over 700 common English words, the BASIC code for which is supplied on disk for inclusion in the user's own programs. The robotic-voice mode uses a phoneme-based, text-to-speech program to provide the user's system with an unlimited vocabulary.

This mode allows any text printed on the screen to be spoken, following over 400 language pronunciation rules.

Software commands are used to control the rate of speech, the output mode, and how the screen text should be read (word by word, letter by letter, with or without punctuation expressed). Pitch and volume are also under software control.

(List Price: \$149.95)
Street Electronics, Inc.
1140 Mark Ave.
Carpinteria, CA 93013
(805) 684-4593

CIRCLE 771 ON
READER SERVICE CARD

Tallgrass HardFile Drives

A new line of Winchester drives with integral tape backup, featuring a new format for recording data on cartridge tape. This new format permits greater data densities on standard 1/4-inch tape, yielding up to 60 megabytes of storage capacity on a standard cartridge.

The Tallgrass 5000 and 6000 series hard disk subsystems include four models with hard disk storage capacities ranging from 25 to 80 megabytes, all with the integral 60-megabyte cartridge tape drive. Also available in the new product line is the Tallgrass 4060—the 60-megabyte cartridge tape drive in a standalone enclosure for PCs with internal hard disks.

The PC/Tape format used by the new tape drives uses ANSI standard DC-600A or DC-615A tape cartridges. Standard DOS-like commands allow the user to work with both the hard disk and the tape. The user's system can be booted directly from

cludes the following models:

- TG-4060 Tape Drive—60 MB backup unit for use with existing hard disks in the user's PC, PC-XT, or AT.
- TG-5025 HardFile—25 MB hard disk/60 MB tape backup.
- TG-6135 HardFile—35



Tallgrass HardFile Drives, Tallgrass Technologies Corp.

the Tallgrass hard disk.

The tape drives establish individual directories for each tape volume and allow files to be written to a cartridge in a random access-like fashion. This approach permits individual files to be modified or appended without erasing the entire contents of the cartridge.

Files can be backed up onto the cartridges individually, in selected groups, or as part of all the files on the hard disk. The cartridge drive includes error-correcting abilities that can correct up to 4K per 8K block of data on tape.

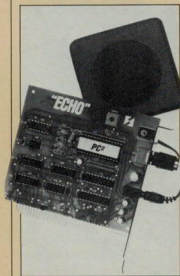
The new Tallgrass line in-

MB hard disk/60 MB backup.

- TG-6050 HardFile—50 MB hard disk/60 MB backup.
- TG-6180 HardFile—80 MB hard disk/60 MB backup.

(List Price: TG-4060, \$1,995; TG-5025, \$3,495; TG-6135, \$4,495; TG-6050, \$5,495; TG-6180, \$7,495)
Tallgrass Technologies Corp.
11100 W. 82nd St.
Overland Park, KS 66214
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Telex: 43-7121

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Echo PC₂, Street Electronics, Inc.

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- Search Sectors For Data

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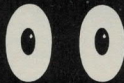
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An intelligent coprocessing/hard disk controller board for the IBM PC, PC-XT, or PC AT. The IQ188 Coprocessor is designed around Intel's 16-bit iAPX188 microprocessor chip (operating at an 8-megahertz clock rate) and offers 32K of EPROM, 256K RAM (expandable to 1 megabyte on the board), a clock/calendar, two serial ports and one parallel port, and a controller interface for any ST-506 type of drive. The board operates independently of the PC, requiring only power and ground signals.

Software included with the board offers spooling for the serial and parallel interfaces, a subset VT100 terminal emulator, a PC-resident iAPX188 assembly debugger, and DOS device drivers for the clock/calendar, hard disk, and RAMdisk.

An enhanced IQ188 package available for the IBM PC includes an internal hard disk capable of operating without modifications to the PC's standard power supply.

(List Price: Board only with 256K RAM, \$1,595)
Winning Designs
 7910 Ivanhoe St., #230
 La Jolla, CA 92037
 (619) 483-7556

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LaserConnections

A line of interface devices permitting IBM PCs and Displaywriter equipment and software to extend their use of the Hewlett-Packard LaserJet laser printer. Of the four interface units in the line, three work specifically with IBM PCs, XT's, and AT's, allowing up to three personal computers to be linked to a common LaserJet printer.



LaserConnections, Extended Systems

The LaserConnection line's major PC models, ESI-2613 and ESI-2617, are cluster controllers that occupy one slot in the user's system. Model ESI-2613 can accept input from the user's system and two external PCs linked to it via Centronics parallel ports. The board converts signals from the three PCs into a serial format, then buffers them for output to the printer.

The ESI-2617 controller board accepts input from the host PC and two external PCs via serial ports. The board's external input ports use Data Terminal Ready (DTR) handshaking protocol and support data transfers at 300, 600, 1,200, 2,400, 4,800, 9,600, and 19,200 bits per second. An available option operates the board's serial ports in 20 milliamp Current Loop mode, allowing remote Cs to be placed up to 1,000 feet from the host system.

Both models of cluster

controller boards offer 128K RAM of buffer memory, upgradable to 512K. This memory permits all three linked PCs to "print" simultaneously, without waiting for the other users to finish.

The other PC model in the LaserConnection line, ESI-1312, is a device driver for the Displaywriter 2 program, allowing this word processing software to directly access the features of the LaserJet printer. Each LaserConnection device includes diagnostic hardware, the Displaywriter 2 driver, cabling, and documentation.

(List Price: ESI-2613 and ESI-2617, \$1,695 each; additional units, \$895; options, \$100-\$512; ESI-1312, \$895)

Requires: Hewlett-Packard LaserJet printer.

Extended Systems
 6062 Morris Hill Ln.
 P.O. Box 4937
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 (208) 322-7163
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IQ188 Coprocessor, Winning Designs

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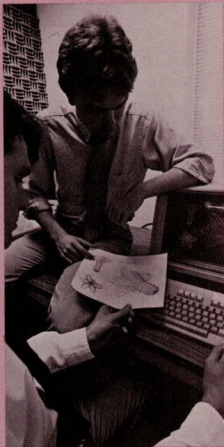
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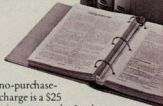
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are included in the program, and internal calculations are accurate to more than 11 decimal places.

(List Price: \$495)

Requires: 64K RAM, two disk drives, PC-DOS, color/graphics adapter. *T & W Systems, Inc.* 7372 Prince Dr., #106 Huntington Beach, CA 92647

(714) 847-9960

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Requires: 192K RAM, two disk drives, PC-DOS, *Symphony*.

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Versa-CAD Entry Level, T & W Systems, Inc.

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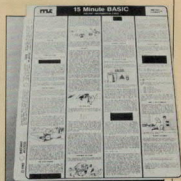
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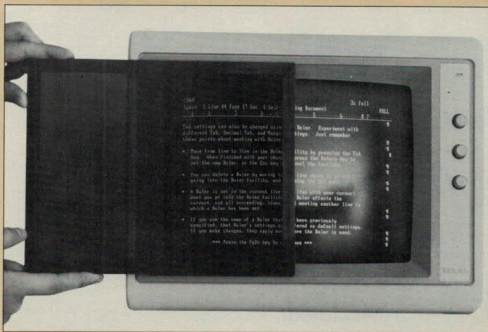
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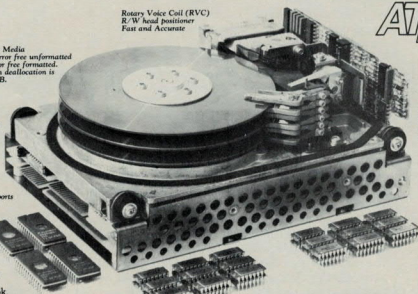
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So, even a fast drive without data protection is virtually worthless. Frankly, we'd rather sleep at night.

BEWARE OF USER-DEPENDENT PROTECTION SCHEMES.

Some drives have a safe landing zone for the heads, but you need to call a separate program to send 'em there. If you don't call that program, and most folks won't, the heads in these drives ALWAYS land on data when powered down.

The slightest bump or vibration can move the heads, wiping out those data tracks. And the R/W heads can become contaminated, thus increasing the error rate, slowing down average access until the whole drive fails.

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An Entrepreneurial State of Mind

The *Computer Entrepreneurs* reads like a social register of who's who in the microcomputer industry. Over 60 men and women reveal how they became millionaires in just a few short years.

Sixty-five top achievers—the smartest, savviest, and richest—of America's hottest industry reveal how they have cashed in on the personal computer phenomenon in *The Computer Entrepreneurs*, a new book by Robert Levering, Michael Katz, and Milton Moskowitz. With backgrounds ranging from farm girl, to race car driver, to alligator wrestler, to teenage tire thief, the key figures in this collection divulge enough juicy gossip, trivia, and little-known facts to make this a richly entertaining book.

Levering, Katz, and Moskowitz profile not only the media stars you'd expect to find, but also many behind-the-scenes people whose achievements are less well known but no less spectacular. Although the authors don't reveal how they selected the 65 who made it into the book, they do recognize that for every success in this volatile industry there are hundreds of dreamers who

haven't made it out of the garage.

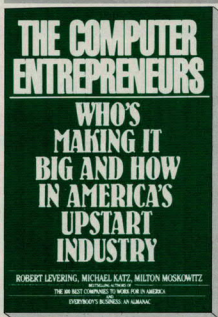
The entrepreneurial spirit is what sets these 65 apart: a willingness to grab opportunity, work hard, and, above all, take risks. This spirit was so integral to the early development of the

Common Denominators

The book groups the 65 subjects by their major areas of interest: hardware, software, peripherals, merchandising, information, and venture capital. In spite of these neat categories, however, the stories overlap considerably. Many of these people share common events and places, and in describing them, *The Computer Entrepreneurs* becomes, in part, a popular history of the personal computer industry.

One common denominator is the Altair computer kit from MITS, an Albuquerque, New Mexico, company. A 1975 *Popular Electronics* article on the kit is cited repeatedly throughout the book because the implications of the Altair galvanized many early computer enthusiasts, including Bill Gates of Microsoft, George Tate of Ashton-Tate, and William Millard at ComputerLand. In addition, California's Homebrew Computer Club, the first user group, was a source of camaraderie and support for several people in the book. On the East Coast, the free-thinking programmers at MIT's Computer Science Lab realized early on that there was life beyond the mainframe. Among those who got their start at MIT are Joel Berez of Infocom, the Cambridge, Massachusetts, company that created *Zork* and other interactive fiction games, and Daniel Bricklin of Software Arts, which is best known for creating *VisiCalc*.

The profiles in *The Computer Entrepreneurs* fall into an easy, almanac-like rhythm. They don't dawdle. Each opens with a list of essential biographical infor-



microcomputer industry that even IBM tried to foster it in its Entry Systems Division in Boca Raton. A new word, *intrapreneurship*, has even been coined to describe the phenomenon whereby a large company encourages individual initiative. As Don Estridge, head of IBM's Entry Systems, puts it, "If you're competing against people who started in a garage, you have to start in a garage."

THE FACT FILE

The Computer Entrepreneurs:
Who's Making It Big and How in America's Upstart Industry

Robert Levering, Michael Katz, and Milton Moskowitz
New American Library
1633 Broadway
New York, NY 10019
(212) 397-8000
Copyright: 1984

Cover Price: \$19.95
ISBN: 0-453-00477-6

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mation, followed by a narrative summary of the events leading up to the "big break."

In addition to the standard data, the authors include a "personal transportation" category.

As with any group of wealthy people, the high-ticket European cars abound, especially the Mercedes, which is evidently de rigueur for the West Coast set. The Boston contingent favors Toyotas, Hondas, and Saabs. Those who live between the coasts go for American cars. And, of course, a few have airplanes and boats.

No Magic Formula

Personal transportation notwithstanding, the quantitative information in *The Computer Entrepreneurs* does not by itself offer insight into the microcomputer phenomenon. The 65 entrepreneurs are a diverse group that defies pigeonholing.

It's obvious that, at least in the personal computer industry, success has little to do with age. At 29, Adam Green of Software Banc, a Massachusetts company that produces software training semi-

The quantitative information in *The Computer Entrepreneurs* does not by itself offer insight into the microcomputer phenomenon.

nars, earns as much as \$25,000 for a weekend training session; Apple's 30-year-old Steve Jobs is reportedly worth \$200 million; and few need to be reminded of what Bill Gates accomplished while still a teenager. On the other hand, 66-year-old Andrew Kay had a personal

net worth of \$245 million at the time of Kaypro's public offering.

Educational backgrounds run the gamut from computer science and mathematics to psychology, philosophy, and business. Several of the entrepreneurs have Ph.D.'s, and Marty Alpert of Tecmar has a medical degree. In contrast, a few don't even have a college or high school degree. Some have sold their companies as public offerings; more have kept a tight hold on their enterprises. No perfect demographic profile or magic formula seems to exist.

A Sixties Mentality

The microcomputer boom has created a special world, the authors suggest. There are few game rules, so counter-culture types fit right in as long as they're enterprising and smart. Untethered by many of the limitations of a traditional corporate environment, these prodigies let their brains run

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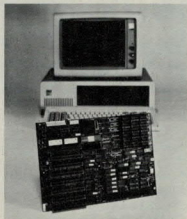
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BOOK REVIEW

wild. A genuine respect for intellectual freedom—a benchmark of the personal computer industry—really does exist. Many theorize that growing up in the 1960s had something to do with the entrepreneurial spirit of most of these individuals.

Just under half of the 65 people polled by the authors were between the ages of 30 and 39 when they founded their companies. Consequently, they may well have been influenced by the liberal social attitudes that prevailed in the sixties and early seventies. Today, they want their companies to be progressive and egalitarian. They strongly believe their employees should enjoy their work and do it well.

Fred Gibbons of Software Publishing, maker of the pfs family of low-priced software, works in a cubicle just like every other employee. He has no secretary and claims, "There's no status in the company." The late George Tate, founder of the phenomenally successful Ashton-Tate, remained concerned with doing all he could to "create a good atmosphere for the people who work here." Dennis Hayes's Hayes Microcomputer was voted one of the best places to work in Atlanta because it emphasizes career advancement and education. Lotus Development Corp.'s Mitch Kapor has tried to make Lotus "open and responsive," and strives to hire women and minorities.

A Rose Is Still a Rose

For all of this progressiveness, however, an entrepreneur is still an entrepreneur. Throughout the profiles, a common theme is the quest for power—often at the expense of personal life and family. The stories start to flow together tediously, and you realize that if so-and-so didn't have \$100 million, he wouldn't be interesting at all, not to mention that his arrogance and colossal ego would not be tolerated for a minute. Of course, the book's authors never ask us to like their subjects.

The microcomputer industry is still decades too young to allow historians to look at its participants and say they made a lasting, positive contribution to society. In fact, the fortunes of several of the people profiled in this book have

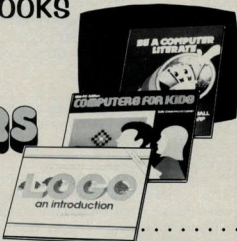
changed in the short months since the book's publication. But that's part of the game.

The Computer Entrepreneurs is a well-researched, diverting book. It's

filled with enough colorful personalities, impressive statistics, and trivia to make it interesting to both industry insiders and observers and, of course, hopeful entrepreneurs. ■

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By Sally Greenwood Larsen

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Be a Computer Literate

By Marion Ball and Sylvia Charp

Illustrated by Jonathan Byrd

Explains in simple terms how and why a computer functions. Illustrations, diagrams and photos make each concept clear without over-simplifying. This book offers a good overview of computers, with emphasis on larger systems. 8 1/2" x 11", softcover, illustrated. \$6.95 (\$1.50). #6H.

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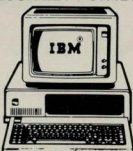
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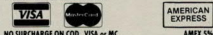
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3460 Wilshire Blvd.
Los Angeles, CA 90010
(213) 387-2100
Stan Johnson - Account Representative
(212) 503-5100
CA (Los Angeles & San Diego), HI
Barbara Farkas - District Manager
3460 Wilshire Blvd.
Los Angeles, CA 90010
(213) 387-2100
Joanna Broome - Account Representative
(212) 503-5100

HOW TO BUY

PC SYSTEMS

IBM PC w/256K, two 360K drives, controller, keyboard, monochrome printer adapter, monochrome monitor	\$2195
IBM PC w/256K, two 360K drives, controller, keyboard, color/graphics adapter, hi res color monitor	\$2495
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ML 93 (160 cps wide carriage dot matrix)	\$625
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DATAPRODUCTS 8010, 8020, 8050, 8070	*
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SYSGEN Quickfile 60MB Streaming Tape Back-Up	*
Image XT cassette tape back-up	\$745
IIG-10 (External 10MB hard disk with tape back-up)	\$2395
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PC User Groups

This list is a partial directory of PC user group names and addresses. Use this listing to locate other PC aficionados who congregate in your area or around the world.

RHODE ISLAND

BCS, Greater Rhode Island
IBM PC User Group
c/o Roger K. Greenail, Jr.
University of Rhode Island
Academic Computer Center
Kingston, RI 02881
(401) 792-2301

SOUTH CAROLINA

IBM PC User Group
c/o Lenny Greene
701 E. Bay St., #222
Charleston, SC 29403

Palmetto Personal Computer
Club
P.O. Box 2046
Columbia, SC 29202

Upstate IBM PC Computer Club
c/o Gary Teska
1102 Fork Shoals Rd.
Simpsonville, SC 29681
(803) 243-3970

TENNESSEE

IBM PC User Group
c/o Ross Burrus
Science Applications, Inc.
Plaza Tower, #801
Oak Ridge, TN 37830
(615) 482-6649

Memphis Area IBM-PC Users'
Group
c/o Peter Vermilye
P.O. Box 241756
Memphis, TN 38122
(901) 345-8760

TEXAS

Bay Area Personal Computer
Organization (BAPCO)
c/o Earl Rubenstein
P.O. Box 58098
Houston, TX 77058-8098

Centex PC Users Group
c/o Pat Macken
P.O. Box 10169
Austin, TX 78766-1169
(512) 458-6996

Houston Area League of PC
Users
c/o Duane C. Hendricks
P.O. Box 61266
Houston, TX 77208
(713) 831-3367
(713) 772-1371

Fort Worth IBM-PC Users
Group
c/o Bill Rosenthal
P.O. Box 16100
Fort Worth, TX 76135
(817) 249-3327

Golden Triangle PC Club
c/o Bill Cox
Rt. 3 Box 502
Orange, TX 77630
(409) 745-3081
(409) 786-3246

Dallas-Fort Worth User Club
c/o Samuel P. Cook
309 Lincolnshire
Irving, TX 75061
(214) 253-6979

West Texas Personal Computer
Users Group
P.O. Box 8951
Amarillo, TX 79114

Texas User Group
c/o Ken Holcombe
178 Tipperary
San Antonio, TX 78223
(512) 333-7163

Southwest PC User Group
c/o William G. Barker
806 E. Abram, Suite 308
Arlington, TX 76010
(817) 261-7120

Alamo PC Organization
P.O. Box 16433
San Antonio, TX 78216

North Texas IBM-PC Users
Group
2025 Rockcreek Dr.
Arlington, TX 76010

Longview Users Group
c/o Ron Ferguson
P.O. Box 2504
Longview, TX 75606
(214) 753-2292
(214) 983-3824

UTAH

Utah Blue Chips
150 W. North Temple, Room 251
Salt Lake City, UT 84114

Genealogical PC User Group
c/o Joanna W. Posey
P.O. Box 338
Orem, UT 84057
(801) 374-6168

VIRGINIA

IBM PC Users Group
c/o Wes Merchant
2906 Montauk Ct.
Falls Church, VA 22042
BBS# (703) 560-0979

Peninsula IBM PC User Group
c/o Mike Savin
P.O. Box 7476, Riverdale Station
Hampton, VA 23666
(804) 898-3849

The Central Virginia User Group
c/o Webb Blackman, Jr.
P.O. Box 34446
Richmond, VA 23234

PC-Tidewater User Group
c/o Vic Freeman
P.O. Box 64454
Virginia Beach, VA 23464

WASHINGTON

The PNW IBM User Group
P.O. Box 3363
Bellevue, WA 98009

BorderLine IBM PC Users
Group
c/o Gary B. Rohrabough
2812 Cedarwood Ave.
Bellingham, WA 98225
(206) 671-3181
(206) 676-0999

So that PC can keep its listing of PC user groups current on its Interactive Reader Service bulletin board, please send new addresses or address changes to PC Magazine's Interactive Reader Service, Club News, One Park Ave., New York, NY 10016. You can also leave a message on the bulletin board.

IBM-Medical User Group

c/o Roger B. Lee, M.D. Col MC
Department of Obstetrics and
Gynecology
Madigan Army Medical Center
Tacoma, WA 98431
(206) 967-6732

Pacific Northwest IBM PC Users Group

c/o William Mohr
P.O. Box 3363
Bellevue, WA 98009

Yakima Valley PC/Users Group

c/o George D. Eastman
4205 West Way
Yakima, WA 98908
(509) 966-4993

The Sanyo National Users Group

c/o Michael Russell
P.O. Box 2084CS
Pullman, WA 99163
(509) 878-1714

WEST VIRGINIA**Morgantown IBM PC Users Club**

P.O. Box 1085
Morgantown, WV 26507-1085

Huntington PC Users Groups

c/o Levi Lauvray
Huntington Alloys
P.O. Box 1958
Huntington, WV 25720
(304) 743-6241

WISCONSIN**Madison IBM-PC User's Group**

c/o Philip J. Niehoff
P.O. Box 2598
Madison, WI 53701-2598
(608) 255-7641

Eau Claire Area PC Users Group

P.O. Box 1369
Eau Claire, WI 54702
Bulletin board: (715) 839-6263
5 p.m. to 8 a.m. weekdays
All day on weekends and holidays

Milwaukee Area IBM PC User

Group
P.O. Box 305
Elm Grove, WI 53122

CANADA**London IBM PC Users Group**

Box 1141
Station "B"
London, Ontario
Canada N6A 5K2

Personal Computer Association (PCA)

P.O. Box 251
Ajax, Ontario
Canada L1S 3C3
Telex: 06-986766

Northern Alberta PC User Group

c/o Jim Lavolette
37 Brunswick Crescent
St. Albert, Alberta
Canada T8N 2K5
(403) 458-9066

The Southern Alberta IBM PC User Group

108 Crowchild Trail N.W.
Calgary, Alberta
Canada T2N 2R2
(403) 270-3182

The Greater Victoria IBM PC User's Group

c/o Dennis Wellborn
P.O. Box 6051, Station C
Victoria, British Columbia
Canada V8P 5L4

Co-operators Microcomputer Club

c/o Adrian Groenendyke
The Co-operators
1920 College Ave.
Regina, Saskatchewan
Canada S4P 1C4

Niagara District IBM PC Users Group

c/o Mr. S. R. Drake
6 Rodman Hall Dr.
St. Catharines, Ontario
Canada L2R 1P2

IBM PC Users Group of Winnipeg

c/o Executive Secretary
350 Dunrobin Ave.
Winnipeg, Manitoba
Canada R2U 0T6

Club des Utilisateurs IBM PC de la Haute Yamaska

P.O. Box 128
Granby, Quebec
Canada J2G 8E4

Saskatoon PC Users Group

65 Arts Building
University of Saskatchewan
Saskatoon, Saskatchewan
Canada S7N 0W0
(306) 242-3134

The Personal Computer Club of Toronto

c/o Leon Rudanyez
P.O. Box 266, Station 'A'
Toronto, Ontario
Canada M5W 1B2

Burl-Oak IBM PC Users' Club

c/o Keith Miller
2088 Salmon Rd.
Oakville, Ontario
Canada L6L 1M3

Club des Utilisateurs d'IBM PC de Montréal

c/o Bernard Mataigne
5054 rue Fabre
Montréal, Quebec
Canada H2J 3W4
(514) 524-7352

Ottawa IBM PC Users Group

P.O. Box 16023
Station F
Ottawa, Ontario
Canada K2C 3S8

INTERNATIONAL**Okinawa IBM PC Users Group**

c/o Major Ron E. Stephens
P.O. Box 395 Butler
FPO Seattle, WA 98773
(206) 635-4664
(206) 637-2620

PC Club Zürich

c/o Kurt Furer
Keunzlistrasse 38
Switzerland CH-8057 Zürich
(1) 363 02 90

Auckland IBM PC User Group

Terry Bowden
Box 6210
Auckland, New Zealand
(64) 9-452639

Tokyo PC

C.P.O. Box 1145
Tokyo 100-91
Japan

Marketing Manager's IBM PC Workshop

c/o Professor Luis G. Renart
IESE
Ave. Pearson, 21
Barcelona-34
Spain

Common Europe

Princesa 2
28008 Madrid
Spain

APL * Plus-Users Group-International

c/o Mr. Martti Pitkanen
APLcomp Ky
Alaportti ID
02210 ESP00 21
*tel 358-0-8037277

Club PC de Mexico, A.C.

c/o Salvador Ruiz de Ch.
Apartado Postal 99-064
10100 Mexico, D.F.

This is the final appearance of Club News. A complete, updated list of user group names and addresses will be available on PC's Interactive Reader Service bulletin board at (212) 696-0360. The bulletin board operates 24 hours day, at 1200 baud, no parity, 8 data bits, and 1 stop bit (1200,N,8,1).

Because of the surge of interest in PC's Interactive Reader Service bulletin board (and bulletin boards in general), in the next issue, this space will contain a one-time list of some of the top IBM-PC and PC-compatible bulletin boards across the nation.

Two issues from now, PC will begin running its popular Spreadsheet Clinic on a continuing basis, edited by contributing editor Jared Taylor. If you have any helpful spreadsheet hints, tips, macros, or shortcuts, send them in to Mr. Taylor. We'll pay \$50 for any ideas we publish—plus a \$25 bonus if you send them to us on a disk, by MCI mail, or through PC's Interactive Reader Service bulletin board.

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Making Book With Word Processing

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I recently finished my first book. The subject was computers, the illustrations were drawn by a computer buff, and the text was written, of course, on a word processor. When the last chapter rolled off the printer, I carefully packaged the manuscript and sent it off to a Big Eastern Publishing House. Then, just as carefully, I uncorked a bottle of champagne to celebrate the book's completion. Before I could down two glasses of the bubbly, the editor at the publishing house called to acknowledge receipt of the package. During this conversation he casually dropped a bombshell—bound books would not be available for at least 8 months.

"What are you going to do," I screamed, "inscribe each page by hand?" He patiently explained the steps of the production cycle, starting with edi-

torial review, proceeding through copyediting, typesetting, proofreading, and indexing, and culminating with printing.

I listened without a whimper, then played my ace. Since the manuscript was already stored on electronic media—my word processing disk—we could streamline typesetting and proofreading, shaving a month off of the schedule. I would simply instruct my computer to send the word processing file to the typesetter's computer, and, voila, one book ready for composition.

However, the publisher's production supervisor then chimed in and trumped my ace by pointing out that my 400-page manuscript switched typefaces as often as a nervous chameleon changes colors. From the typesetter's perspective, it would be just as easy to rekey the entire text. She concluded by saying that my

technological tome would have to take the conventional 8 months.

I swallowed the news reluctantly, but my fundamental question remained unanswered. Legions of writers weave books on disks. Shouldn't publishers take advantage of machine-readable formats to streamline production?

Guidelines Coming

The publisher's production people explained that they expect to establish guidelines for electronic submission of manuscripts within the calendar year. Currently, they receive less than 10 percent of the books they publish on disk, even though about 50 percent of their authors use word processors.

One book that will take the high-tech path to the print shop is a revision of a photography tutorial that has sold over a million copies. The text will be written and editorial changes made on an IBM PC. The typesetting company is geared to accept the PC disks. Capturing the text from a word processing file rather than keyboarding it into the typesetting computer should save about 2 weeks in the production cycle and another week or two in proofreading time.

According to the operations manager, the success of such an arrangement depends upon early agreement between author, publisher, and typesetter on the format of the electronic media. Word processing is of no benefit during editing and production unless everyone uses compatible computers.

Despite compatibility problems, a number of publishers do encourage au-

thors to submit manuscripts on disk in addition to supplying the conventional paper copy. One of the largest, McGraw-Hill, can handle virtually any type of word processing format. Says Stuart Rothenstein, the company's director of publishing technology, "When a manuscript has been accepted by the editorial department, we'll transmit the word processing file from the author's disk to our in-house system through a serial link. On the in-house computer, editors make changes and corrections from any of approximately 50 terminals tied to our Editorial Text Management System. The electronic output of that system goes to a composition company contracted to typeset the book."

Rothenstein didn't have precise figures on how much time McGraw-Hill saves this way, but he does cite a work-book project as an example. "With conventional typesetting, the project would have required a production cycle of 4 months. We cut that time in half by maintaining the text on a word processor and printing camera-ready copy on a laser printer."

Money for Authors

A McGraw-Hill editor says that the cost of copy editing, proofreading, and composition frequently amounts to \$10,000 for a single book. "If the author incurs those expenses by providing camera-ready copy," asserts the editor, "then we will make that money available."

That tack was taken recently by H. McGilton and R. Morgan, the authors of *Introducing the Unix System* (New York, 1983). They typeset the text themselves under the close supervision of McGraw-Hill's staff and produced camera-ready copy with a high-quality laser printer. Currently, the book ranks as the number one seller in McGraw-Hill's paperback line.

The Cutting Edge

If any one firm is sharpening the cutting edge of computing technology in publishing, you'd expect it to be the Computer Science Press. This Rockville, Maryland, publisher handles 25 titles per year. Editor-in-chief Dr. Arthur

Friedman encourages submission of manuscripts on disk. He now has four books under contract that will be delivered in electronic form, using word processing setups ranging from *Word Juggler* on an Apple to *WordStar* on an Osborne to UNIX's troff editor on a VAX. The typesetting company hired for the composition work uses conversion programs to handle all of these formats.

Despite compatibility problems, a number of publishers do encourage authors to submit their manuscripts on disk.

"If you must enter the main body of text from the keyboard during typesetting, you run the risk of introducing errors," Friedman observes. "A word processing disk eliminates these errors. We've found the major benefit from electronic media to be time and accuracy, not necessarily cost."

Other publishers reported to accept electronic media include Holt, Reinhart & Winston; Ballantine; Macmillan; Prentice-Hall; Viking Penguin; and John Wiley and Sons. Some of these firms pass along typesetting savings directly to authors. Others increase the royalty percentage. In any book contract, everything is negotiable.

Among authors who submit a word processed disk to the typesetter, the level of involvement varies widely. The compositor may simply massage the author's word processing file, inserting editorial corrections and typesetting commands. Or the author may take responsibility for embedding editorial changes and typesetting codes and delivering the word processed file prepared to produce camera-ready copy.

How many authors will be willing to tangle with cryptic typesetting codes remains to be seen. Clearly, involvement confers benefits in the areas of control, accuracy, and costs. Overseeing the typesetting of their manuscripts allows authors to exercise complete control, mitigating any unpleasant surprises. When the galley proofs of my book came

back I was dismayed to see that the typeface the publisher had chosen represented the digit zero as a spitting image of an upper-case letter O. This similarity leads to confusion in a computer book, forcing you to read between the lines to decipher statements like "WHILE (IO(XO) = 10) DO." Had I been more involved in the production process, this glitch might not have occurred.

A Lot of Work

Free-lance writer Owen Davies incorporated typesetting codes in his word processing file while preparing *The Omni Online Database Directory* (New York, 1983), a book he co-wrote with PC executive editor Mike Edelhart that was published by Macmillan. Davies reports that the directory went to press at least 3 weeks early because he inserted the codes in the text. He was pleased to speed up such a time-critical project, but he admits that, "I can live without doing typeset coding again."

Tim McGuire, a production supervisor at St. Martin's Press, sides with Davies on that point. "We still have writers who write in longhand and hire a secretary for typing. They're not going to want to get involved with typesetting." Of St. Martin's 175 annual titles, he says, only 3 books, "authored by sophisticated computer jocks," were delivered electronically.

"Our experience has shown that a captured keystroke saves only 15 to 25 percent of a typesetter's billed costs," McGuire concludes. "At \$6 to \$8 per page for an average fiction novel, we're not talking about a whole lot of money."

Nevertheless, wordsmiths should be aware that the disk they toiled over needn't be filed away once the manuscript has been shipped to the publisher. If you're publishing a book, check with the sponsoring editor and production supervisor. Ask if the typesetter can deal with a word processing file, and if so, what formatting techniques would streamline the typesetting process. Most importantly, write a clause in the book contract specifying that the cost savings be tacked on to the author's advance. You might even get enough to cover the expense of a champagne glass. ■

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COMING UP



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Microcomputer COBOL

PC Tech Journal casts its practiced eye on COBOL products in the microcomputer arena. The first of three articles examines RM COBOL from Ryan-McFarland and Realia COBOL from Realia, Inc.

CPU Accelerator Boards

Users who want to improve the PC's execution speed will be interested in two accelerator boards for the PC that actually boost the speed of the CPU. PC Tech Journal tested two such boards: the Kameron Labs PC-Excellerator and the Orchid Technology PCTurbo-186.

Hard Disk Storage Alternative

The Bernoulli Box, an external drive system from Iomega that stores two 8-inch cartridge drives that each store 10 megabytes of data. PC Tech Journal offers a thorough review of this unique product.

Data Security and the PC

A close look at seven encryption products for the PC—how they work and their relative cryptographic strengths.

Turbo Pascal I/O Library

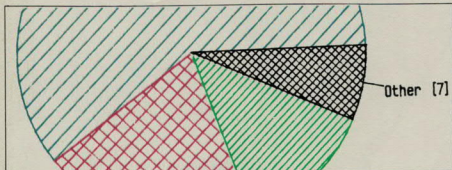
The first part of this two-part article examines an I/O library that cures two of Turbo Pascal's deficiencies: file handling and screen handling. It explains when, why, and how to use the library and presents solutions to problems of handling path names, tree-structured directories, and I/O redirection. It also provides the complete source code.

C Tools

Our C expert puts seven C library products to the test.



Coming Up



Business Graphics Software

"Graphics" is a magical word to most PC users. To a game enthusiast, it means colorful, imaginative landscapes. To an architect, a precise high-resolution drawing comes to mind. For business, however, what's required is the ability to convey often dry statistics and projections with elegance, clarity, and imagination. To this end, specialized presentation graphics programs have become an essential weapon in any complete arsenal of business software.

The market for these products is infinitely complex. What's worse, there's no one sure method of categorizing or choosing among them. Most will give you the basics: simple bar, pie, and line charts. Some, however, offer more exotic functions, such as free-form drawing, multiple fonts for a classier look, 3-D backgrounds, and multiple chart overlays. Many feature libraries of predesigned images, giving even beginners the chance to create a slick, professional look for their finished output. With so many products available, each of which does surprisingly different things in startlingly different ways, choosing one of them means foraging through a jungle of complexities.

PC dedicates most of an issue to guiding you through this jungle. While there is no single package that will meet everybody's needs, there is sure to be at least one that meets yours. In our usual comprehensive manner, we painstakingly test and review more than 30 of the most interesting and popular business-specific graphics programs. The results? Charts of hard data are passed along to you so that you can compare the products side by side, feature by feature. PC's reviewers then tell you what they really think, separating the truly excellent from the hardly usable. And for those of you who must see it to believe it, actual output from each package is included as a visual aid in choosing from a field of very visual products.

Contributing editor Glenn Hart introduces you to this wonderful world of presentation graphics. Katherine Alesandrini wraps it up with clues on how to decide what you need in a business graphics package and how to match software to those needs.

Columns

In the Education column, Robin Raskin tells how she uses her PC as an educational tool at school fairs. Dr. Bernard Friedman gives tips on the "do's and don'ts" of selling office billing software to M.D.s in the Medicine column. And N.B. Forrest takes a look at some new business forecasting programs in the Business column.

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Some Companies Think Video Adapters Are Like Aluminum Foil On The End Of Rabbit Ears.



We Don't. At STB We Think Solutions Should Work.

That's Why We Designed The Graphix Plus II.

Let's face the facts. You need a video adapter for your computer. You don't need the bothersome problems that most often tag along.

When we built the Graphix Plus II we left the problems behind and made solutions the standard feature.

At STB, we think the Graphix Plus II is the only video board you will ever need for your IBM PC,™ IBM PC AT,™ IBM XT™ or compatible. Here's why:

If you use a monochrome monitor, the Graphix Plus II gives you clear, sharp monochrome text and graphics.

If you use a color monitor, the Graphix Plus II matches IBM's standard resolutions for color graphics. But the Graphix Plus II goes beyond the standards. Our video board gives you four and sixteen color modes as well as full screen monochrome graphics with the use of software drivers.

For your convenience, we include drivers for Lotus™ 1-2-3,™ Symphony™ and Framework.

If you use color and monochrome monitors, the Graphix Plus II supports both, and automatically switches display to the appropriate screen.

The solutions go on...

The Graphix Plus II gives you a parallel printer port, a lightpen interface, 32K of display memory, an optional clock/calendar and STB's one year warranty.

PC Accelerator™ software, for the print buffering and high speed disk emulation you need, is also packaged with our Graphix Plus II.

And of course, when you tune in to your favorite program...

You won't be bothered with fuzzy fonts, flickering displays or flashy scrolling. After all, STB creates solutions, not more problems.

When you think of video adapters, think of STB's Graphix Plus II and forget the rabbit ears. Let's keep life simple. For more information about our problem-solving products, call or write STB Systems, Inc., 601 North Glenville, Suite 125, Richardson, Texas 75081. (214) 234-8750.

Keep
Life
Simple



STB
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